JULY, 1929

25 Cents, $1 a Year

Contractors and Engineers Monthly

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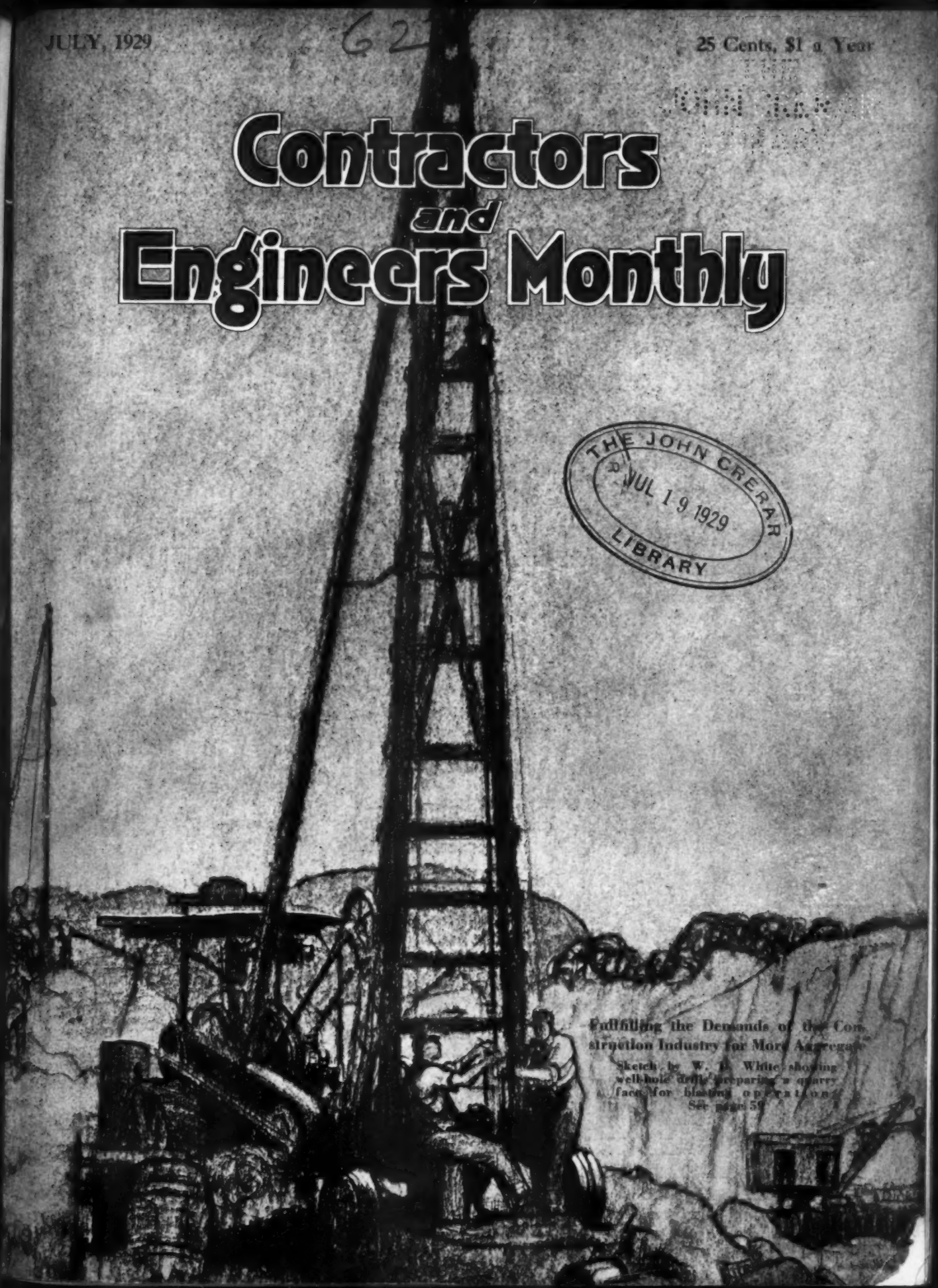

Fulfilling the Demands of the Construction Industry for More Aggregate

Sketch by W. D. White showing well-hole drills preparing a quarry face for blasting operations

See page 59

For Hard Work and Heavy Driving

in Sand Pit and Gravel Bank
for Stone Pile or Batching
for Stripping and Grading

Subgrade Cutting—Where Yardage Counts

The NEW NELSON Q-7 LOADER

The Newest, Biggest and Best of the NELSON Heavy-Duty Crawler Loaders powered by McCormick 10/20 Tractor.

Full Two-Yard Elevating Capacity
Smooth-running powerful feeders
Extra long ground-gripping crawlers
Clear discharge height 9½ feet
Simple design,—sound construction
The best your money can buy.

LOW FIRST COST
LOW OPERATING COST
LOW MAINTENANCE

Write for Particulars

The N. P. NELSON IRON WORKS, Inc.
825 Bloomfield Avenue, Passaic, N. J.

Vol. XLIX, No. 1 CONTRACTORS AND ENGINEERS MONTHLY, JULY, 1929 Price, 25 Cnts; $1 a Year
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Where to Purchase

A comprehensive classification of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers and public officials who may wish to secure information about construction equipment.
The Index of Advertisers faces the inside back cover. When writing to advertisers please mention the CONTRACTORS & ENGINEERS MONTHLY. A star (*) before the manufacturer's name indicates that his advertisement appears in this issue.

This index is published as an aid to the reader, but the publishers assume no responsibility for errors or omissions.

AIR COMPRESSORS

*Buhl Company, Chicago
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Independent Pn. Tool Co., Chicago, Ill.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Sullivan Machinery Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee
American Steam Pump Co., Battle Creek, Mich.
Barnes Mfg. Co., Mansfield, O.
Cement-Gun Co., Allentown, Pa.
Chicago Pneumatic Tool Co., N. Y.
Cook Motor Co., Delaware, O.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
De Laval Steam Turbine Co., Trenton, N. J.
Fairbanks, Morse & Co., Chicago.
Gardner-Denver Co., Quincy, Ill.
General Electric Co., Schenectady, N. Y.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Indiana Air Pump Co., Indianapolis, Ind.
Ingersoll-Rand Co., N. Y.
Nordberg Mfg. Co., Milwaukee, Wis.
Norwalk Iron Works Co., So. Norwalk, Conn.
Schramm, Inc., West Chester, Pa.
United Iron Works, Kansas City, Mo.
Westinghouse Traction Brake Co., Wilmerding, Pa.
Worthington Pump & Machinery Corp., N. Y.

AIR COMPRESSORS, PORTABLE

*Buhl Co., Chicago
*Chain Belt Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Independent Pneu. Tool Co., Chicago
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sullivan Machinery Co., Chicago
Cement-Gun Co., Allentown, Pa.
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Ingersoll-Rand Co., New York
Metalweld, Inc., Philadelphia, Pa.
National Brake & Electric Co., Milwaukee
Schramm, Inc., West Chester, Pa.
Simons Paint Spray Brush Co., Dayton, O.

ARTESIAN WELL DRILLS & PUMPS

American Well Works, Aurora, Ill.
Ingersoll-Rand Co., New York
Star Drilling Machine Co., Akron, O.

ASPHALT

*Barber Asphalt Co., Philadelphia
*Barrett Co., N. Y.
*Standard Oil Co. (Ind.), Chicago
*Standard Oil Co. (N. Y.), N. Y.
*Warren Bros. Co., Boston
Atlantic Ref. & Asph. Corp., Philadelphia
Gulf Refining Co., Pittsburg
Ky. Rock Asph. Co., Louisville, Ky.
Natural Rk. Asph. Corp., Owensboro, Ky.
New Orleans Ref. Co., New Orleans
Pioneer Asph. Co., Lawrenceville, Ill.
Sinclair Ref. Co., Chicago
Standard Oil Co. of Cal., S. Francisco
Standard Oil Co. of La., N. Orleans
Standard Oil Co. of N. J., Newark
Texas Co., N. Y.

ASPHALT BLOCK

Hastings Pavement Co., N. Y.

ASPHALT BRICK

Asphalt Brick Co., St. Louis

ASPHALT CUTTERS

*Independent Pneumatic Tool Co., Chicago
*Sullivan Machinery Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, O.
Dayton Pneum. Tool Co., Dayton, O.
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., N. Y.
Littleford Bros., Cincinnati.

ASPHALT KETTLES (See Kettles for Asphalt and Tar Heating)

ASPHALT PLANTS, TOOLS, ETC.

*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Company, Philadelphia
*Warren Bros. Co., Boston
Aeroil Burner Co., West New York, N. J.
American Fin-Mix Co., Chicago.
Charleroi Iron Wks., Charleroi, Pa.
F. D. Cummer & Son Co., Cleveland, O.
J. D. Farasey Mfg. Co., Cleveland, O.
Hetherington & Berner, Indianapolis
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati
Merriman Asphalt Plant, Inc., Lima, O.

ASPHALT POURING POTS (See Pots, Asphalt Pouring)

ASPHALT ROLLERS (See Road Rollers)

ASPHALT SURFACE HEATERS

*Barber Asphalt Co., Philadelphia
*Chausse Oil Burner Co., Elkhart, Ind.
Aeroil Burner Co., West New York, N. J.
Equitable Asp. Maint. Co., Kan. City, Mo.
Hauck Mfg. Co., Brooklyn, N. Y.

BACKFILLERS

*Baker Mfg. Co., Springfield, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Construction Machy. Co., Waterloo, Ia.
*General Wheelbarrow Co., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
Austin Mach. Corp., Muskegon, Mich.
Buckeye Trac. Ditcher Co., Findlay, O.
Byers Mach. Co., Ravenna, O.
Erstad Mfg. Co., Portland, Ore.
General Excavator Co., Marion, O.
Harnischfeger Corp., Milwaukee, Wis.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Link-Belt Co., Chicago
Miami Trailer-Scraper Co., Troy, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa
Waterman Corp., Detroit
Weller Mfg. Co., Chicago

BAGS

Bates Valve Bag Corp., Chicago

BAG TRUCKS

Bates Valve Bag Corp., Chicago
Case Crane & Engg. Co., Columbus, O.

BAR BENDERS AND CUTTERS

*Koehring Co., Milwaukee, Wis.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Buffalo Forge Co., Buffalo, N. Y.
Concrete Steel Co., N. Y.
Electric Welding Co., Pittsburgh
D. A. Hinman & Co., Sandwich, Ill.
J. L. Gleason & Co., Boston, Mass.
Kardong Bros., Minneapolis
McKenna Co., Cleveland, O.

BARRICADE SUPPORTS

Cleveland Steel Spec. Corp., Cleveland, O.

BAR TIES

Bates Valve Bag Corp., Chicago
Symons Clamp & Mfg. Co., Chicago, Ill.

BATCH BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const. Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, O.
*Jos. Heuherst Co., Cincinnati
*Lakewood Eng. Co., Cleveland, O.
Easton Car & Const. Co., Easton, Pa.
Easton Car & Const. Co. of Mo., Kansas C., Mo.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
Littleford Bros., Cincinnati
Jas. B. Seaverns Co., Batavia, Ill.
Western Wheeled Scraper Co., Aurora, Ill.

BATCHERS (For Measuring Aggregates)

*Blaw-Knox Co., Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Construction Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, O.
Superior Engineering Co., Warren, Ohio.

BEARINGS

Fafnir Bearing Co., New Britain, Conn.
Hyatt Roller Bear. Co., Harrison, N. J.
New Departure Mfg. Co., Bristol, Conn.
S. K. F. Industries, New York
Timken Roller Bearing Co., Canton, O.

BINS, STORAGE

*Austin-Western Rd. Mach. Co., Chicago
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*The Burch Corp., Crestline, Ohio
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const. Co., Erie, Pa.
*Fairfield Engineering Co., Marion, Ohio
*Good Roads Mchy. Co., Kennett Sq., Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland, O.
*Ransome Conc. Machy. Co., Dunellen, N. J.
Austin Mfg. Co., Chicago
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Easton Car & Const'n. Co., Easton, Pa.
Galion Iron Works & Mfg. Co., Galion, Ohio
O. S. Johnson Co., Champaign, Ill.
Lancaster Iron Works, Inc., Lancaster, Pa.
Link-Belt Co., Chicago
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago.

BLADES FOR GRADERS & SNOW PLOWS

*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis
Galion Iron Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

BLAST HOLE DRILLING MACHINES (See Well Drilling and Blast Hole Machines)

BLASTING POWDER (See Explosives)

BLOCKS AND TACKLE

*Boston & Lockport Blk. Co., Boston, Mass.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
Western Block Co., Lockport, N. Y.

BLOW TORCHES

*Chausse Oil Burner Co., Elkhart, Ind.
*G. H. Williams Co., Erie, Pa.
Everhot Mfg. Co., Maywood, Ill.

BLUE PRINT MACHINES

Paragon Mach. Co., Rochester, N. Y.
C. F. Pease Co., Chicago
Wickes Bros., Saginaw, Mich.

BOILERS

*Johnston Bros., Inc., Ferrysburg, Mich.
Chandler & Taylor Co., Indianapolis
Chatta. Boiler & Tank Co., Chatta., Tenn.
R. D. Cole Mfg. Co., Newnan, Ga.
Combustian Eng. Corp., N. Y.
Erie City Iron Works, Erie, Pa.
Hartley Blr. Works, Montgomery, Ala.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heine Boiler Co., St. Louis, Mo.
E. Keeler Co., Williamsport, Pa.

For Directory of Local Distributors of Contractors' Equipment, See Pages 135 to 159

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C763
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285356

Where to Purchase

BOILERS, (Continued)
Ladd Water Tube Bir. Co., Pittsburgh, Pa.
V. Loffel & Co., Springfield, Ohio
Lord & Burnham Co., Irvington, N. Y.
Murray Iron Works Co., Burlington, Iowa
Nagle Eng. & Bir. Works, Erie, Pa.
New Bern Iron Works & Sup. Co., New Bern, N. C.
Petroleum Iron Works Co., Sharon, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Stanwood Corp., Cincinnati, Ohio
Superior Body Corp., Marion, Ind.
Vogt. Mchy. Co., Inc., Louisville, Ky.

BRACES, TRENCH
*Templeton, Kenly & Co., Chicago
Jas. H. Channon Mfg. Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Fisher & Hayes Rope & Steel Co., Chicago
Hawley Mfg. Co., Chicago
Kalamazoo Fdry. & Mach. Co., Kalamazoo, Mich.
Waldo Bros. & Bond Co., Boston

BRANDING TOOLS
Everhot Mfg. Co., Maywood, Ill.

BRASS GOODS
Glauber Brass. Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Company, Decatur, Ill.
Union Water Meter Co., Worcester, Mass.
United-Obendorf Corp., Cleveland, Ohio

BREAKERS, CONCRETE
*Independent Pn. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., N. Y.
Cleveland Rock Drill Co., Cleveland, Ohio
Gardner-Denver Co., Quincy, Ill.
Hardsoog Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York
Milwaukee Gas Tool Co., Milwaukee
Rapid Concrete Breaker Co., Los Angeles, Cal.

BRICK, PAVING (See Paving Brick)

BRIDGE FLOORS
*Armco Culvert Mfrs. Assn., Middletown, O.

BRIDGES AND BUILDINGS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Frederick Snare Corporation, N. Y.
American Bridge Co., N. Y.
Bellefontaine Br. & Stl. Co., Bellefontaine, O.
Belmont Iron Works, Philadelphia
Berlin Constr. Co., Berlin, Conn.
Bethlehem Steel Co., Bethlehem, Pa.
Boston Bridge Works, Boston
Butler Mfg. Co., Minneapolis, Minn.
Central States Br. Co., Indianapolis, Ind.
Champion Bridge Co., Wilmington, Ohio
Chesapeake Iron Works, Baltimore, Md.
Clinton Bridge Works, Clinton, Iowa
Eastern Bridge & Struc. Co., Worcester, Mass.
Flour City Orn. Iron Co., Minneapolis
Fort Pitt Br. Works, Pittsburgh, Pa.
Hughes-Keenan Co., Mansfield, Ohio
Ingalls Iron Works Co., Birmingham, Ala.
Inter. Steel & Iron Co., Evansville, Ind.
Lakeside Br. & St. Co., No. Milwaukee.
Louisville Br. & Iron Co., Louisville, Ky.
McClintic Marshall Co., Pittsburgh, Pa.
Milwaukee Br. Co., Milwaukee, Wis.
Minn. Stl. & Mchy. Co., Minneapolis
Missouri Vy. Br. & Ir. Co., Leavenworth, Kan.
Mt. Vernon Br. Co., Mt. Vernon, Ohio
Penn Bridge Co., Beaver Falls, Pa.
Pittsburgh-Des Moines Stl. Co., Pittsburgh, Pa.
Richmond Struc. Stl. Co., Richmond, Va.
Riverside Br. Co., Martins Ferry, Ohio.
Virginia Br. & Ir. Co., Roanoke, Va.
Wisc. Br. & Ir. Co., No. Milwaukee, Wis.

BROOMS (See Street Sweeping Brooms)

BUCKETS, AUTOMATIC DUMPING
*Lakewood Eng. Co., Cleveland, O.
*Union Iron Wks., Inc., Hoboken, N. J.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, CLAM SHELL
*Blaw-Knox Co., Pittsburgh, Pa.
*Erie Steel Const. Co., Erie, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Buffalo Hst. & Dor. Co., Buffalo, N. Y.
Browning Crane Co., Cleveland, Ohio
F. A. Coleman Co., Cleveland, Ohio
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio
Page Eng. Co., Chicago

BUCKETS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
*Union Iron Works, Inc., Hoboken, N. J.
Norris K. Davis, San Francisco, Calif.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.

BUCKETS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*Blaw-Knox Co., Pittsburgh, Pa.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N. Y.
*Hayward Co., New York
*Sauerman Bros., Chicago
Schofield-Burkett Constr. Co., Macon, Ga.
*G. H. Williams Co., Erie, Pa.
Link-Belt Co., Chicago
Monighan Mach. Co., Chicago
Page Eng. Co., Chicago
Pioneer Bucket Co., Indianapolis, Ind.

BUCKETS, DREDGING AND EXCAVATING
*Blaw-Knox Co., Pittsburgh, Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Hayward Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
*Lakewood Eng. Co., Cleveland, Ohio
*G. H. Williams Co., Erie, Pa.
Browning Crane Co., Cleveland
J. F. Kiesler Co., Chicago
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago
Owen Bucket Co., Cleveland, Ohio

BUCKETS, ORANGE PEEL
*Hayward Co., N. Y.
Industrial Works, Bay City, Mich.
J. F. Kiesler Co., Chicago
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., E. Boston, Mass.
Orton Crane & Shovel Co., Chicago

BUILDING FORMS (See Forms, Conc.)

BUILDINGS, STEEL (See Bridges)

BULLDOZERS
*Trackson Co., Milwaukee, Wis.
Miami Trailer-Scraper Co.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa

BUNKS AND COTS
Ft. Pitt Bedding Co., Pittsburgh, Pa.
Haggard & Marcusson Co., Chicago
Southern Rome Co., Baltimore, Md.

CABLES (See Wire and Cable)

CABLEWAYS, DRAGLINE
*Beaumont Mfg. Co., Philadelphia
*S. Flory Mfg. Co., Bangor, Pa.
*L. P. Green, Chicago
*Sauerman Bros., Chicago
Schofield-Burkett Constr. Co., Macon, Ga.
Link-Belt Co., Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
Street Bros. Mach. Works, Chattanooga

CABS FOR MOTOR TRUCKS
Highland Body Mfg. Co., Cincinnati, Ohio
Weatherproof Body Corp., Corunna, Mich.

CAISSONS
American Bridge Co., N. Y.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Foundation Co., N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
O'Rourke Eng. Constr. Co., N. Y.
Petroleum Ir. Wks. Co., Sharon, Pa

CALCIUM CHLORIDE FOR ROADS
*Dow Chemical Co., Midland, Mich.
*Pittsburgh Plate Glass Co., Barberton, O.
*Solvay Sales Corp., New York

CANS FOR GARBAGE AND REFUSE
American Can Co., N. Y.
Economy Baler Co., Ann Arbor, Mich.
Rochester Can Co., Rochester, N. Y.
Solar-Sturges Mfg. Co., Melrose Pk., Ill.
Witt Cornice Co., Cincinnati, Ohio

CAR UNLOADERS (See Loaders)

CARS, INDUSTRIAL V. DUMPING
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
Atlas Car & Mfg. Co., Cleveland, Ohio
Austin Mfg. Co., Chicago
Case Crane & Engg. Co., Columbus, O.
Chase Fdry. & Mfg. Co., Columbus, Ohio
Easton Car & Const. Co., Easton, Pa.
C. W. Hunt Co., W. New Brighton, N. Y.
Koppel Ind. Car & Equip. Co., Koppel, Pa.
G. L. Steubner Ir. Wks., Inc., L. I. City, N. Y.
United Ir. Wks., Inc., Kansas City, Mo.
Weller Mfg. Co., Chicago
Whiting Corp., Harvey, Ill.

CARTS, CONCRETE
*General Wheelbarrow Co., Cleveland, Ohio
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Case Crane & Engg. Co., Columbus, O.
Chattanooga Wheelbarrow Co., Chatta., Tenn.
Cleveland Wheelbarrow Co., Cleveland, Ohio
Easton Car & Const. Co., Easton, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Gray Iron Fdry. Co., Reading, Pa.
Jackson Mfg. Co., Harrisburg, Pa.
Lee Trailer & Body Co., Plymouth, Ind.
Sterling Wheelbarrow Co., Milwaukee
Toledo Wheelbarrow Co., Toledo, Ohio

CAST IRON PIPE (See Pipe, Cast Iron)

CASTINGS, STEEL
*Brown Clutch Co., Sandusky, Ohio
*Cleveland Steel Tool Co., Cleveland
*Farrell-Cheek Steel Fdy. Co., Sandusky, Ohio
*G. H. Williams Co., Erie, Pa.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CASTINGS, STREET AND SEWER
*Armco Culvert Mfrs. Assn., Middletown, Ohio
*Central Fdry. Co., N. Y.
*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.
Canton Fdry. & Mach. Co., Canton, Ohio
H. W. Clark Co., Matteon, Ill.
J. B. Clow & Sons, Chicago
W. E. Dee Co., Chicago
Denley Bros. Co., Cleveland
Elkhart Fdry. & Mach. Co., Elkhart, Ind.
Gallion Iron Works & Mfg. Co., Gallon, O.
Gilbert Mfg. Co., Aberdeen, S. Dak.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Klauer Mfg. Co., Dubuque, Iowa
Madison Fdry. Co., Cleveland, Ohio
Pechstein Iron Works, Keokuk, Iowa
Sessions Foundry Co., Bristol, Conn.
South Bend Fdry. Co., So. Bend, Ind.

CATCH BASINS (See Castings, Street)

CATCH BASIN CLEANING OUTFITS
Atlas Sales Corp., New York
Elgin Sales Corp., N. Y.
Mack Trucks, Inc., N. Y.

CAULKING MACHINERY AND TOOLS
*Independent Pn. Tool Co., Chicago
Cleveland Rock Drill Co., Cleveland, Ohio
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
Mueller Company, Decatur, Ill.

CEMENT—(P. C. stands for Portland Cement)
*Pittsburgh Plate Glass Co., Barberton, Ohio
Acme Cement Corp., Catskill, N. Y.
Ætna P. C. Co., Detroit, Mich.
Allentown P. C. Co., Catasauqua, Pa.
Alpha P. C. Co., Easton, Pa.
Ash Grove Lime & P. C. Co., Kansas City, Mo.
Atlas P. C. Co., N. Y.
Beaver P. C. Co., Portland, Ore.
Bessemer Limestone & C. Co., Youngstown, O.
British Col. Cement Co., Victoria, B. C.
Canada Cement Co., Ltd., Montreal, Canada
Colorado P. C. Co., Denver, Colo.
Consolidated Cement Corp., Chicago
Cowell P. C. Co., Cowell, Cal.
Crescent P. C. Co., Wampum, Pa.
Dewey P. C. Co., Kansas City, Mo.
Diamond P. C. Co., Cleveland, Ohio
Edison P. C. Co., N. Y.
Georgia Cement & Stone Co., Birmingham, Ala.
Giant P. C. Co., Philadelphia, Pa.
Glens Falls P. C. Co., Glens Falls, N. Y.
Golden State P. C. Co., Los Angeles, Cal.
Great West'n P. C. Co., Kansas City, Mo.
Hawkeye P. C. Co., Des Moines, Iowa
Hercules Cement Corp., Philadelphia
Hermitage P. C. Co., Nashville, Tenn.
Huron P. C. Co., Detroit, Mich.
International Cement Corp., N. Y.
International P. C. Co., Ltd., Spokane, Wash.
Kosmos P. C. Co., Louisville, Ky.
La Tolteca Compania de Cemento Portland, Mexico City, Mex.
Lawrence Cement Co., New York
Lehigh P. C. Co., Allentown, Pa.
Louisville Cement Co., Louisville, Ky.
Manitowoc P. C. Co., Manitowoc, Wis.
Marlboro Cement Co., Edmonton, Can.
Marquette Cement Mfg. Co., Chicago
Missouri P. C. Co., St. Louis, Mo.

General Contractor Equipment . . Helps Sharpen Your Pencil

THE contractor who uses quality equipment can sharpen his pencil with confidence, because he knows exactly what his equipment will do on the job. He counts these known factors into his estimates, and invariably "comes out all right."

General Contractor Equipment is dependable, specialized for construction work, long lived, and constantly improved. It contains every modern refinement worth buying, together with advanced features to be had from no other manufacturer. The General Concrete Cart, with an unbreakable underslung axle that *can't even wear,* is an example. The General Measuring Tray Barrow pictured below is another.

Behind General Contractor Equipment stand tested, clean-cut policies without strings. Typical is this General guarantee:

"All General equipment must deliver complete satisfaction to the user, and he is the judge. Every General distributor is instructed and fully authorized to carry out this guarantee."

Such equipment and such policies put certainty into a contractor's figures, into his business and his profits. Mail the coupon for details.

GENERAL WHEELBARROW COMPANY

Associated Companies:
The Empire Plow Co. General Wheelbarrow Co.

Headquarters for Wheelbarrows, Concrete Carts, Steel Mortar Boxes, Salamanders, Coal Chutes, Agricultural Implements, Plow Shapes, Scrapers, Road Grader Blades.

3140 East 65th Street Cleveland, Ohio

EMPIRE
Road Grader Blades

Empire Road Grader Blades have been furnished for over 40 years to leading road grader manufacturers. They are now being marketed direct through distributors by General Wheelbarrow Company. They are made of a new, exclusive alloy steel, and have an exact degree of curvature for better grading. Ask for our folder on "Highway Equipment."

GENERAL
Narrow Front Measuring Tray Barrow

The General Narrow Front Measuring Tray Barrow grows daily in popularity because it saves time and therefore makes money. It places materials exactly where you want them. It is now specified by state highway departments. It levels off to measure at five accurate capacities graduated at even half cubic foot intervals.

General
General Wheelbarrow Co. Cleveland U.S.A.

GENERAL WHEELBARROW COMPANY
3140 East 65th Street, Cleveland, Ohio

Send us your New General Wheelbarrow Handbook No. 108. Our distributor's name and address are

.....

.....

Name.....

Company Name.....

Street Address.....

City, State.....

LOOK FOR THE ORANGE HANDLES

Where to Purchase

CEMENT (Continued)

Monarch Cement Co., Humboldt, Kans.
Monolith P. C. Co., Los Angeles, Cal.
National Cement Co., Birmingham, Ala.
Nazareth Cement Co., Nazareth, Pa.
Nebraska Cement Co., Denver, Colo.
Newago P. C. Co., Newago, Mich.
New Egyptian P. C. Co., Detroit
North Amer. Cement Corp., Albany, N. Y.
Northwestern States P. C. Co., Mason City, Ia.
Oklahoma P. C. Co., Denver
Olympic P. C. Co., Ltd., Seattle
Oregon P. C. Co., Portland, Ore.
Pacific P. C. Co., San Francisco
Peerless P. C. Co., Detroit, Mich
Peninsular P. C. Co., Cement City, Mich.
Penn-Allen Cement Co., Nazareth, Pa.
Pennsylvania-Dixie Cement Corp., N. Y.
Petoskey P. C. Co., Petoskey, Mich.
Phoenix P. C. Co., Philadelphia
P. C. Co. of Utah, Salt Lake City
Pyramid P. C. Co., Des Moines
Riverside P. C. Co., Los Angeles
St. Marys Cement Co., Toronto, Can.
San Antonio P. C. Co., San Antonio
Sandusky Cement Co., Cleveland, Ohio
Santa Cruz P. C. Co., San Francisco
Signal Mountain P. C. Co., Chatta., Tenn.
Southern States P. C. Co., Rockport, Ga.
Southwest'n. P. C. Co., Los Angeles, Cal.
Standard P. C. Co., Cleveland
Standard P. C. Co., Cleveland
Sun P. C. Co., Portland, Ore.
Superior P. C. Co., Seattle, Wash.
Three Forks P. C. Co., Denver, Colo.
Tidewater P. C. Co., Baltimore, Md.
Trinity P. C. Co., Dallas, Tex.
Union P. C. Co., Denver, Colo.
U. S. P. C. Co., Denver, Colo.
Universal P. C. Co., Chicago
Utah Idaho Cement Co., Ogden, Utah
Vulcanite P. C. Co., Philadelphia
Wabash P. C. Co., Detroit
Warrior Cement Corp., Chatta., Tenn.
Wellston Iron Furnace Co., Jackson, Ohio
Wolverine P. C. Co., Coldwater, Mich.
Wyandotte P. C. Co., Detroit

CEMENT BLOCK MACHINES

*Cement Block Machy. Co., Newark, N. J.
Abrams Cement Tool Co., Detroit, Mich.
Zagelmeyer Cast Stone Block Machy Co., Bay City, Mich.

CEMENT GUNS

Cement-Gun Co., Allentown, Pa.

CEMENT INSPECTION (See Inspecting Laboratories)

CEMENT TOOLS

*American Fork & Hoe Co., Cleveland
Abrams Cement Tool Co., Detroit

CENTRIFUGAL PUMPS (See Pumps, Centrifugal)

CHAINS

*Chain Belt Co., Milwaukee, Wis.
Amer. Chain Co., Inc., Bridgeport, Conn.
Columbus McKinnon Chain Co., Columbus, O.
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
U. S. Chain & Forge Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CHIMNEYS, CONCRETE

Heine Chimney Co., Chicago
Rust Engineering Co., Pittsburgh, Pa.
Weber Chimney Co., Chicago

CHIMNEYS, RADIAL BRICK

Amer. Chimney Corp., N. Y.
Continental Chimney Co. of Chicago, Chicago
Alphons Custodis Chimney Const. Co., N. Y.
Heine Chimney Co., Chicago
H. H. Heinicke, Inc., Indianapolis, Ind.
M. W. Kellogg & Co., N. Y.
Rust Eng. Co., Pittsburgh, Pa.

CHIMNEYS, STEEL (See Stacks, Steel)

CHISELS, CHIPPING

*Cleveland Steel Tool Co., Cleveland, Ohio

CHLORINATORS

*Wallace & Tiernan Co., Inc., Newark, N. J.
Norwood Engr. Co., Florence, Mass.
Paradon Eng. Co., Arlington, N. J.

CHLORINE, LIQUID (See Liquid Chlorine)

CHUTES, CONCRETE

*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.

CLAMPS & TIES, FORM

*Insley Mfg. Co., Indianapolis
Batavia Clamp Co., Inc., Batavia, N. Y.
Concrete Form-Hold Co., Inc., Culver City, Cal.
Concrete Form Tie Corp., Pittsburgh, Pa.
Esy-Set Wall Tie Co., Dayton, O.
W. A. Kuhlman & Co., Toledo
M. & M. Wire Clamp Co., Minneapolis
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.

CLAMPS, COLUMN

*Ellis & Ford Mfg. Co., Detroit, Mich.
*Insley Mfg. Co., Indianapolis, Ind.
Black Bros. Co., Mendota, Ill.
Concrete Eng. Co., Omaha, Neb.
Handy Mfg. Co., Chicago
Kardong Bros., Inc., Minneapolis
W. A. Kuhlman & Co., Toledo, Ohio
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
J. E. Porter Corp., Ottawa, Ill.
H. W. Roos Co., Cincinnati
Steelform Contracting Co., San Francisco
Sterling Wheelbarrow Co., Milwaukee
Symons Clamp & Mfg. Co., Chicago
James L. Taylor Mfg. Co., Poughkeepsie, N. Y.
Universal Form Clamp Co., Chicago

CLAY DIGGERS, PNEUMATIC

*Independent Pneu. Tool Co., Chicago
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Gardner-Denver Co., Quincy, Ill.
Ingersoll-Rand Co., New York

CLAY PIPE (See Pipe, Vitrified Clay)

CLIPS, WIRE ROPE

*Amer. Steel & Wire Co., Chicago
Amer. Hoist & Derrick Co., St. Paul, Minn.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
Thos. Laughlin Co., Portland, Me.
Marion Malleable Iron Works, Marion, Ind.
C. M. Mockbee & Co., Cincinnati, Ohio
John A. Roebling Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio

CLUTCHES

*Brown Clutch Co., Sandusky, Ohio
*Twin Disc Clutch Co., Racine, Wis.
*Waukesha Motor Co., Waukesha, Wis.
Brown-Lipe Gear Co., Syracuse, N. Y.
Link-Belt Co., Chicago

COCKS, CURB AND CORPORATION

Chapman Valve Mfg. Co., Indian Orch'd, Mass.
Glauber Brass Mfg. Co., Cleveland, Ohio
Haydenville Co., Haydenville, Mass.
Hays Mfg. Co., Erie, Pa.
Mueller Co., Decatur, Ill.
Union Wtr. Mtr. Co., Worcester, Mass.

COMPRESSORS, AIR (See Air Compressors)

CONCRETE BLOCK MACHINES (See Cement Block Machines)

CONCRETE CURING

*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., New York

CONCRETE HEATERS

*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Alex. Milburn Co., Baltimore, Md.
Aeroil Burner Co., West New York, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati

CONCRETE MIXERS

*Amer. Cem. Mchy. Co., Inc., Keokuk, Iowa
*Atlas Engineering Co., Clintonville, Wis.
*Chain Belt Co., Milwaukee, Wis.
*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee, Wis.
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Con. Mchy. Co., Dunellen, N. J.
Acme Rd. Machy. Co., Frankfort, N. Y.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Badger Con. Mixer Co., Milwaukee
Construction Mchy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
J. B. Foote Fdry. Co., Fredericktown, Ohio
Gray Iron Fdry. Co., Reading, Pa.
Judy Mfg. Co., Centerville, Iowa
Knickerbocker Co., Jackson, Mich.
Kwik-Mix Concrete Mixer Co., Port Washington, Wis.
Leach Co., Oshkosh, Wis.
Mixermobile Co., Milwaukee
Orr & Sembower, Reading, Pa.
Rommel Mfg. Co., Kewaskum, Wis.
Republic Iron Works, Tecumseh, Mich.
T. L. Smith Co., Milwaukee

CONCRETE PAVERS (See Pavers, Concrete)

CONCRETE PILING (See Piling)

CONCRETE PIPE (See Pipe, Concrete)

CONCRETE REINFORCEMENT

*American Steel & Wire Co., Chicago
*Truscon Steel Co., Youngstown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Concrete Steel Co., N. Y.
Consolidated Exp. Metal Co., Wheeling, W. Va.
Electric Welding Co., Pittsburgh, Pa.
Ft. Pitt Bridge Works, Pittsburgh, Pa.
Genfire Steel Co., Youngstown, Ohio
Inland Steel Co., Chicago
Kalman Steel Co., Chicago
Laclede Steel Co., St. Louis, Mo.
National Steel Fabric Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, Ohio
J. T. Ryerson & Son, Chicago
Wickwire-Spencer Steel Co., N. Y.
Youngstown Pressed Steel Co., Warren, Ohio

CONCRETE ROAD FINISHERS

*Blaw-Knox Co., Pittsburgh, Pa.
*A. W. French & Co., Chicago
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio

CONDENSERS

Allis-Chalmers Mfg. Co., Milwaukee
Ingersoll-Rand Co., N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.
Wheeler Cond. & Eng. Co., Carteret, N. J.
Worthington Pump & Machy. Corp., N. Y.

CONDUIT RODS

F. Bissell Co., Toledo, Ohio
Turbine Sewer Mch. Co., Milwaukee
Waldo Bros. & Bond Co., Boston

CONDUITS, UNDERGROUND

Amer. Vitr. Products Co., Akron, Ohio
Johns-Manville, Inc., N. Y.
National Fireproofing Co., N. Y.
Ric-wil Co., Cleveland

CONTRACTORS' EQUIPMENT DEALERS (See Pages 135 to 159

CONVEYORS, BELT

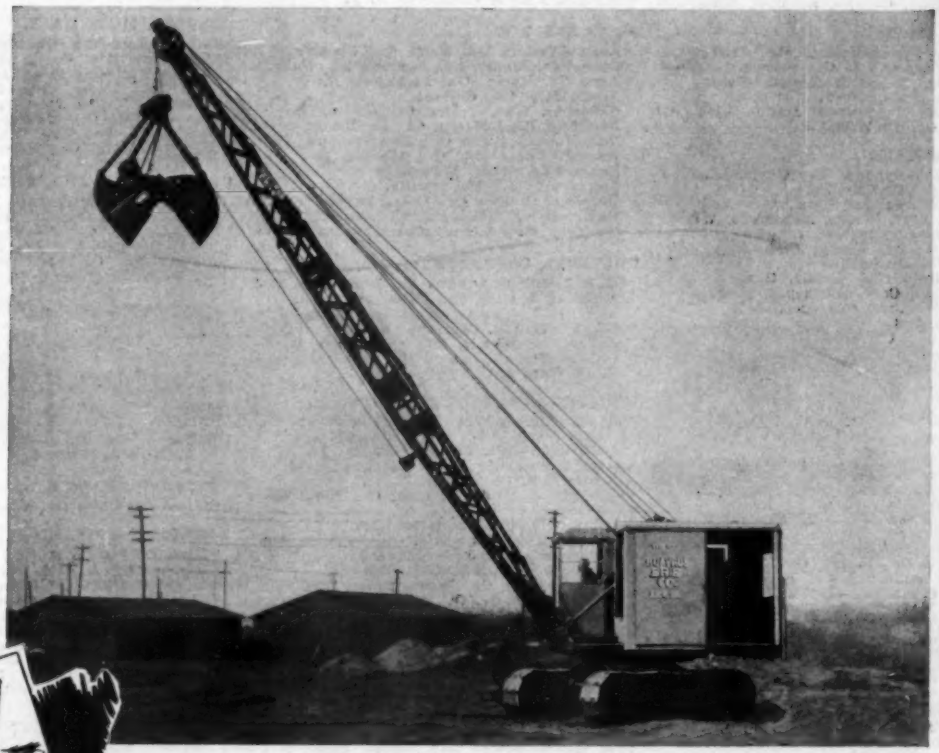
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Mchy. Co., Chicago
*Barber-Greene Co., Aurora, Ill.
*The Burch Corp., Crestline, Ohio
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., New York
*Fairfield Engineering Co., Marion, Ohio
*Good Rds. Mchy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford Wood Co., Hudson, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Samuel Olson & Co., Chicago
Portable Machinery Co., Clifton, N. J.
Robins Conv. Belt. Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.
Smith Eng. Wks., Milwaukee
Standard Conv. Co., No. St. Paul, Minn.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

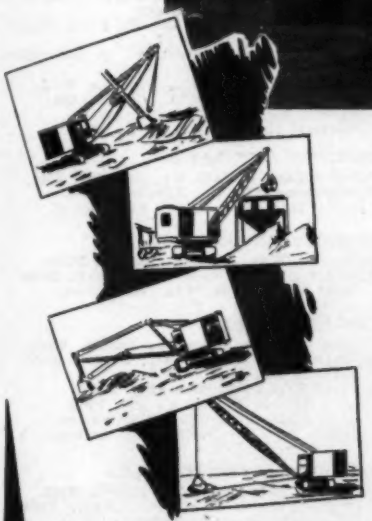
CONVEYORS, BUCKET

*Atlas Engineering Co., Clintonville, Wis.
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Conveying Weigher Co., N. Y.
*Fairfield Engineering Co., Marion, Ohio
*Good Roads Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Jos. Honhorst Co., Cincinnati, Ohio
*Industrial Brownhoist Corp., Cleveland
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
H. W. Caldwell & Son, Chicago
Gifford Wood Co., Hudson, N. Y.
Godfrey Conv. Co., Elkhart, Ind.
Guarantee Constn. Co., N. Y.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co. Chicago
Mead-Morrison Mfg. Co., E. Boston, Mass.
New Holland Mach. Co., N. Holland, Pa.
Samuel Olson & Co., Chicago
Republic Rubber Co., Youngstown, Ohio
Robins Conv. Belt Co., N. Y.
Jas. B. Seaverns Co., Batavia, Ill.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Here's a ½-yd. Crane and Shovel that's BUILT





Model "1030"

Easily convertible — clamshell, shovel, dragline or drag-shovel. Easily changed over for any of these classes of work. Or can be converted to electric power when desired.

With *one-piece truck frame and turntable* instead of structural steel—with gears enclosed and running in oil—with anti-friction bearings—and many other improvements that mean *better value.*

This ½-yard gasoline machine can be used safely miles away from any repair shop—it's a ½-yard machine built to stand up.

Built for service: See this machine and compare its construction. Check the diameters of important shafts, and the sizes of bearings. Note how all parts subject to wear are small and inexpensive, interchangeable and easy to replace.

You get this sturdier construction in the BUCYRUS-ERIE "1020" because BUCYRUS-ERIE Company has the confidence in this machine—and the resources—to invest in the necessary patterns and machines. *It pays the user!*

Absolute Reliability is the standard throughout the "1020". It is practically a BUCYRUS-ERIE "1030" built lighter in proportion.

Easy to move anywhere

In a ½-yard excavating machine, easy mobility is important—and the weight of the BUCYRUS-ERIE "1020" has been kept as low as consistent with the strength to handle hard work.

Write us for complete specifications and working ranges.

BUCYRUS ERIE

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Dallas Detroit
San Francisco Chicago

BUCYRUS-ERIE COMPANY
Plants: So. Milwaukee, Wis., Erie, Pa., Evansville, Ind.
General Offices: South Milwaukee, Wis.

Boston Atlanta
New York Birmingham
Philadelphia Pittsburgh

Representatives throughout U. S. A. and Canada

Offices and Distributors in all principal cities.

Adv. 733-B

Where to Purchase

CONVEYORS, BUCKET (Continued)
Stephens Adamson Mfg. Co., Aurora, Ill.
Universal Crusher Co., Cedar Rapids, Iowa
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago

CONVEYORS, GRAVITY
Lamson Co., Syracuse, N. Y.
Logan Co., Louisville, Ky.
Mathews Conveyor Co., Elwood City, Pa.
Standard Conv. Co., No. St. Paul, Minn.

COUPLINGS, HOSE
*Independent Pneumatic Tool Co., Chicago
Cleveland Pneum. Tool Co., Cleveland, Ohio
Gilman Mfg. Co., East Boston, Mass.
Ingersoll-Rand Co., N. Y.
W. H. Keller, Inc., Grand Haven, Mich.
Maleonroy Co., Philadelphia

CRANES, CRAWLER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
*Universal Crane Co., Lorain, Ohio
Austin Machy. Corp., Muskegon, Mich.
Byers Mach. Corp., Muskegon, Mich.
General Excavator Co., Marion, Ohio
Link-Belt Co., Chicago
McMyler Interstate Co., Cleveland
Mead-Morrison Mfg. Co., Boston
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Star Drilling Mach. Co., Akron, Ohio

CRANES, LOCOMOTIVE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Manitowoc Engr. Works, Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Iowa
*Thew Shovel Co., Lorain, Ohio
Amer. Hst. & Derrick Co., St. Paul, Minn.
Browning Crane Co., Cleveland, Ohio
Davenport Loc. Works, Davenport, Iowa
Link-Belt Co., Chicago
Loc. Crane Co. of Amer., Champaign, Ill.
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Northwest Eng. Works, Chicago
Ohio Loc. Crane Co., Bucyrus, Ohio
Orton Crane & Shovel Co., Chicago
Jas. B. Seaverns Co., Batavia, Ill.
Speeder Mchy. Corp., Cedar Rapids, Iowa
U. S. Crane Co., Chicago

CRANES, ONE-TON
Hughes-Keenan Co., Mansfield, Ohio
Otis Eng. Co., New York
Sterling Tractor Equipment Co., New York
Whitehead & Kales Co., Detroit, Mich.

CRANES, OVERHEAD TRAVELING
*Erie Steel Const'n. Co., Erie, Pa.
Alliance Mach. Co., Alliance, O.
Chesapeake Iron Wks., Baltimore, Md.
Chisholm-Moore Mfg. Co., Cleveland
Curtis Pn. Mchy. Co., St. Louis
Harnischfeger Corp., Milwaukee, Wis.
Milwaukee Elec. Crane Co., Milwaukee
Morgan Eng. Co., Alliance, O.
Northern Eng. Wks., Detroit, Mich.
Shaw Crane Wks., Muskegon, Mich.
Shepard Elec. Cr. & Hst. Co., Montour Falls, N. Y.
Toledo Crane Co., Bucyrus, O.
Whiting Fdry. & Equip. Co., Harvey, Ill.

CRANES, TRUCK
*Universal Crane Co., Lorain, Ohio
Atla Sales Corp., New York
Bay City Fdry. & Mach Co., Bay City, Mich.
Browning Crane Co., Cleveland
Byers Mach. Co., Ravenna, O.
Erstad Mfg. Co., Portland, Ore.
Orton Crane & Shovel Co., Chicago
Harnischfeger Corp., Milwaukee, Wis.

CRANES, WRECKING
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
Industrial Wks., Bay City, Mich.

CRAWLER ATTACHMENTS
*Geo. Haiss Mfg. Co., N. Y.
*Trackson Co., Milwaukee, Wis.
Belle City Mfg. Co., Racine, Wis.
Link-Belt Co., Chicago

CREEPER WHEELS
*Creeper Wheel Co., Reading, Pa.

CREOSOTED BLOCKS, TIMBER, ETC.
Amer. Creos. Co., Inc., Louisville, Ky.
Amer. Creos. Wks., Inc., New Orleans, La.
Ayer & Lord Tie Co., Chicago
Carter Bloxonend Flooring Co., K. City, Mo.
Colonial Cre. Co., Inc., Louisville, Ky.
Compressed Wood Preserv. Co., Cincinnati, O.
Creos. Materials Co., New Orleans, La.
Georgia Creos. Co., Louisville, Ky.
Jennison-Wright Co., Toledo, O.
Long Bell Lumber Co., Kansas City, Mo.
Midland Creos. Co., Granite City, Ill.
Pensacola Creosoting Co., Pensacola, Fla.
Republic Creos. Co., Indianapolis, Ind.
Southern Wood Pres. Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., N. Y.

CRUSHERS, ROCK
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Machy. Co., Kennett Sq., Pa.
Acme Rd. Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Galion Ir. Wks. & Mfg. Co., Galion, O.
New Eng. Road Machy. Co., So. Boston, Mass.
New Holland Mach. Co., New Holland, Pa.
Russell Grader Mfg. Co., Minneapolis
Smith Eng. Wks., Milwaukee
Sturtevant Mill Co., Boston
Universal Crusher Co., Cedar Rapids, Ia.
Universal Rd. Mchy. Co., Kingston, N. Y.
Wheeling Mold & Fdry. Co., Wheeling, W. Va.

CULVERTS, CAST IRON
*U. S. C. I. Pipe & Fdry. Co., Burlington, N. J.
American Casting Co., Birmingham, Ala.
Amer. C. I. Pipe Co., Birmingham, Ala.
Beach Mfg. Co., Charlotte, Mich.
Galion Iron Wks. & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. D. Wood & Co., Philadelphia

CULVERTS, CORRUGATED METAL
*Armco Culvert Mfrs. Assn., Middletown, O.
*Austin-Western Rd. Mach. Co., Chicago
*Good Rds. Mach. Co., Kennett Sq., Pa.
American Casting Co., Birmingham, Ala.
Austin Mfg. Co., Chicago
Bark River Bridge & Culv. Co., Bark River, Mich.
Beach Mfg. Co., Charlotte, Mich.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Berger Mfg. Co., Jacksonville, Fla.
Boardman Co., Okla. City, Okla.
Burnham Mfg. Co., Woods Cross, Utah
Calif. Corr. Culv. Co., W. Berkeley, Cal.
Canada Ingot Ir. Co., Ltd., Guelph, Ont.
Canton Culv. & Silo Co., Canton, O.
Corr. Culv. Co., Moberly, Mo.
Decatur Cornice & Roofing Co., Albany, Ala.
Dixie Culv. & Metal Co., Atlanta, Ga.
Dixie Culv. Mfg. Co., Little Rock, Ark.
Edwards Mfg. Co., Cincinnati
Galion Iron Wks. & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
R. Hardesty Mfg. Co., Denver, Colo.
Highway Prod. & Mfg. Co., Elmira, N. Y.
Ind. Corr. Culv. Co., Mason City, Ia.
Iowa Pure Ir. Co., Des Moines, Ia.
Kentucky Culvert Mfg. Co., Louisville, Ky.
Klauer Mfg. Co., Dubuque, Ia.
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.
Md. Culv. & Metal Co., Baltimore
N. E. Metal Culv. Co., Palmer, Mass.
Nebraska Culv. & Mfg. Co., Wahoo, Neb.
New England Metal Culvert Co., Nashua, N. H.
Newport Culvert Co., Newport, Ky.
Northfield Ir. Co., Northfield, Minn.
Northwest'n Sheet & Ir. Wks., Wahpeton, N.D.
Ohio Corr. Culv. Co., Middletown, O.
W. Q. O'Neall Co., Crawfordsville, Ind.
Pure Iron Culvert & Mfg. Co., Portland, Ore.
Road Supply & Metal Co., Topeka, Kan.
St. Paul Corr. Co., St. Paul, Minn.
Sioux Falls Metal Culv. Co., Sioux Falls, S. D.
So. Metal Culv. Co., Salisbury, N. C.
Spokane Culv. & Tank Co., Spokane, Wash.
Tenn. Metal Culv. Co., Nashville
U. S. Br. & Culv. Co., Bay City, Mich.
Virginia Culvert Corp., Roanoke, Va.
Western Metal Mfg. Co., Houston, Tex.
Wheeling Corr. Co., Wheeling, W. Va.
Wyatt Metal & Bir. Wks., Dallas, Tex.

CULVERT FORMS
*Blaw-Knox Company, Pittsburgh, Pa.
*Heltzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Inc., Syracuse, N. Y.
Northfield Iron Co., Northfield, Minn.

CURB BOXES
H. W. Clark Co., Mattoon, Ill.
J. B. Clow & Sons, Chicago
Columbian Iron Wks., Chattanooga, Tenn.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Madison Fdry. Co., Cleveland, O.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.
R. D. Wood & Co., Philadelphia, Pa.

CURB, GUTTER AND BASE FORMS (See Forms, Concrete)

CURB GUARDS, STEEL
W. S. Godwin Co., Baltimore

CURB, STEEL PROTECTED
*Truscon Steel Co., Youngstown, O.
Concrete Steel Co., N. Y.

CURING OF CONCRETE
*Barber Asphalt Co., Philadelphia
*Dow Chemical Co., Midland, Mich.
*McEverlast, Inc., Los Angeles, Calif.
*Pittsburgh Plate Glass Co., Barberton, Ohio
*Solvay Sales Corp., N. Y.

CUTTERS, PIPE, HAND
*Ellis & Ford Mfg. Co., Detroit
Armstrong Mfg. Co., Bridgeport, Ct.
Barnes Tool Co., New Haven, Ct.
Erie Tool Works, Erie, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Oswego Tool Co., Oswego, N. Y.
Reed Mfg. Co., Erie, Pa.
Walworth Mfg. Co., Boston

CUTTERS, ROD AND WIRE
*Koehring Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Carolus Mfg. Co., Sterling, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Helwig Mfg. Co., St. Paul, Minn.
M. & M. Wire Clamp Co., Minneapolis
Morse-Starrett Prod. Co., Oakland, Calif.
Worthington Pump & Mchy. Corp., N. Y.

CUTTING EDGES
*Caterpillar Tractor Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
J. D. Adams & Co., Indianapolis, Ind.
Shunk Mfg. Co., Bucyrus, O.

CUTTING AND WELDING APPARATUS (See Welding Apparatus)

CYLINDER HEADS, RICARDO
*Waukesha Motor Co., Waukesha, Wis.

DERRICKS, GUY AND STIFF-LEG
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls, N.Y.
*S. Flory Mfg. Co., Bangor, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Sasgen Derrick Co., Chicago
Amer. Hst. & Derrick Co., St. Paul, Minn.
John T. Horton Co., N. Y.
Lakeside Bridge & Steel Co., N. Milwaukee, Wis.
National Hstg. Eng. Co., Harrison, N. J.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.
Universal Hstg. Machy. Corp., Buffalo

DERRICKS, PIPE LAYING
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Lidgerwood Mfg. Co., Elizabeth, N. J.
Street Bros. Mach. Wks., Chattanooga

DERRICKS, REVOLVING
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
Street Bros. Mach. Wks., Chattanooga

DERRICKS, STEEL
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Hayward Co., N. Y.
*Insley Mfg. Co., Indianapolis, Ind.
Amer. Hst. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga
Taylor Port. St. Derrick Co., Chicago

DERRICKS, STEEL PORTABLE
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Lidgerwood Mfg. Co., Elizabeth, N. J.
Amer. Hst. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga

DERRICK FITTINGS
*S. Flory Mfg. Co., Bangor, Pa.
*Hayward Co., N. Y.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Amer. Hst. & Derrick Co., St. Paul
Street Bros. Mach. Wks., Chattanooga

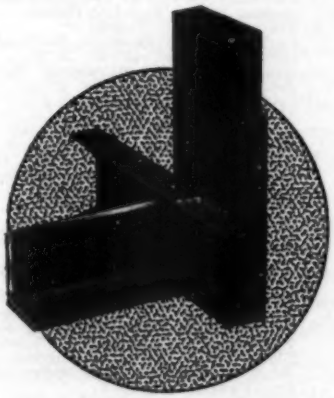
DIAPHRAGM PUMPING OUTFITS
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*John Lauson Mfg. Co., New Holstein, Wis.

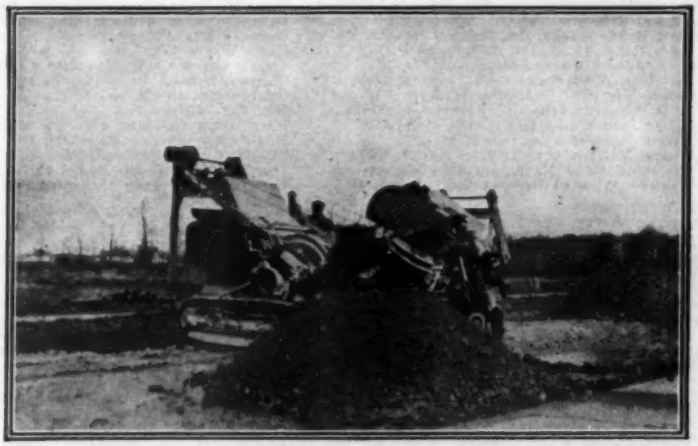
DIESEL ENGINES (See Engines, Oil)

DISTRIBUTORS, TAR AND ASPHALT
*Good Roads Machinery Co., Kennett Sq., Pa.
E. D. Etnyre & Co., Oregon, Ill.
Kinney Mfg. Co., Boston
Municipal Supply Co., So. Bend, Ind.

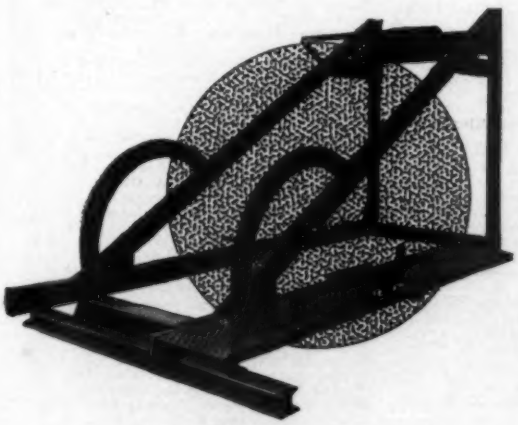
If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

Steadier Profits ~ ~ ~ With The Electrically Welded, Steel Frame Pony-Ditcher





These illustrations show the electrically welded main frame of The Pony-Ditcher and a close-up of one of the welded joints. Other parts that are electrically welded include the crawler frames, conveyor frame, and the excavator boom. This construction combines great strength with light weight and there are no rivets to work loose in service.



Several years ago when the first Pony-Ditcher was built, gangs of men digging ditches were a common sight. Even though bids are figured more closely today, the man who has a dependable ditcher and a good operator on it, can make larger profits than he could under the old system.

The Topping Pony-Ditcher with its welded steel frame, individually self-cleaning buckets, ball bearings on all high-speed shafts, and a dependable crawler mounting that will take it anywhere, is an outstanding buy among small ditchers. Its superior design and quality construction insure big output and a minimum of time out for repairs.

If you are interested in a machine that will put you in the running against competitive bidders and still enable you to make a good profit, just ask our nearby representative for full details on The Pony-Ditcher.

Industrial Brownhoist Corporation, General Offices, Cleveland, Ohio

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, New Orleans, San Francisco, Cleveland.

Plants: Brownhoist Division, Cleveland; Industrial Division, Bay City, Michigan; Elyria Foundry Division, Elyria, Ohio.

INDUSTRIAL BROWNHOIST

Where to Purchase

DISTRIBUTING PLANTS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, O.
*Ransome Conc. Mchy. Co., Dunellen, N. J.

DITCHING MACHINES (See Excavators)

DOORS AND SHUTTERS, STEEL ROLLING
Cornell Iron Wks., L. I. City, N. Y.
Edwards Mfg. Co., Cincinnati, Ohio
Holzer Sheet Metal Works, New Orleans, La.
Kinnear Mfg. Co., Columbus, O.
James Peters & Son, Philadelphia
St. Paul Corrugating Co., St. Paul, Minn.
Variety Rolling Door Co., Westerville, O.
J. G. Wilson Corp., N. Y.

DRAGS, ROAD
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
*Good Roads Machy. Co., Kennett Square, Pa.
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Gallon Iron Works & Mfg. Co., Galion, O.
Miskin Scraper Wks., Ucon, Ia.
Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

DRAWING INKS
*Pelican Works, Gunther Wagner, New York
C. M. Higgins & Co., Brooklyn, N. Y.

DREDGES
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Hayward Co., N. Y.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Ellicott Machy. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Orton Crane & Shovel Co., Chicago
J. S. Schofield's Sons Co., Macon, Ga.
Stockton Iron Wks., Stockton, Cal.
Street Bros. Mach. Wks., Chattanooga
Superior Iron Wks., Superior, Wis.

DREDGES DIPPER
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Osgood Company, Marion, Ohio
Amer. Steel Dredge Co., Ft. Wayne, Ind.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.

DREDGES, HYDRAULIC
*Bucyrus-Erie Co., Erie, Pa.
Ellicott Mach. Corp., Baltimore
Marion Steam Shovel Co., Marion, O.
Morris Mach. Wks., Baldwinsville, N. Y.

DREDGING MACHINERY
*S. Flory Mfg. Co., Bangor, Pa.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Street Bros. Mach. Wks., Chattanooga

DRILL STEEL SHARPENERS (See Sharpeners)

DRILLS, CORE
*McKiernan-Terry Drill Co., N. Y.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Ingersoll-Rand Co., N. Y.

DRILLS, ROCK
*The Buhl Company, Chicago
*Sanderson-Cyclone Drill Co., Orrville, O.
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Cleveland Pneum. Tool Co., Cleveland, O.
Cleveland Rock Drill Co., Cleveland, O.
Dallett Co., Philadelphia
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston
Hardsoog Wonder Drill Co., Ottumwa, Ia.
Holwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
W. H. Keller, Inc., Grand Haven, Mich.
Wood Drill Wks., Paterson, N. J.

DRILLS FOR WELLS AND BLAST HOLES (See Well Drilling Machy.)

DRUMS, HOLDING
*Blaw-Knox Co., Pittsburgh, Pa.
*Clyde Ir. Wks. Sales Co., Duluth, Minn.
*Dobbie Pdry. & Mach. Co., Niagara Falls
*Hayward Co., New York
*Heltzel Steel Form & Ir. Co., Warren, O.
Street Bros. Mach. Wks., Chattanooga

DRYERS, ASPHALT AND CEMENT
Allis-Chalmers Mfg. Co., Milwaukee
Amer. Blower Co., Detroit, Mich.
Atlas Dryer Co., Cleveland, O.
C. O. Bartlett & Snow Co., Cleveland, O.
F. D. Cummer & Son Co., Cleveland, O.
Lancaster Iron Works, Inc., Lancaster, Pa.
Ruggles-Coles Engineering Co., New York.

DRYERS, SAND AND GRAVEL
*Chausse Oil Burner Co., Elkhart, Ind.
*Jos. Honhorst Co., Cincinnati, O.
*Alex. Milburn Co., Baltimore, Md.
Aeroil Burner Co., West New York, N. J.
American Process Co., New York
C. O. Bartlett & Snow Co., Cleveland, O.
Chase & Lyman, Boston
Littleford Bros., Cincinnati, O.

DUMP BODIES FOR CONCRETE
Easton Car & Const. Co., Easton, Pa.
Lee Trailer & Body Co., Plymouth, Ind.

DUMP BODIES FOR MOTOR TRUCKS
*Columbian St. Tank Co., Kansas City, Mo.
*Highway Trailer Co., Edgerton, Wis.
*Wood Hydr. Hoist & Body Co., Detroit
Amer. Prod. & Trad. Co., Chicago
Am. Truck & Body Co., Martinsville, Va.
Anthony Co., Streator, Ill.
Atla Sales Corp., New York
Columbia Body Corp., Columbia, Pa.
Detroit Trailer & Mach. Co., Detroit
Detwiler Mfg. Co., Galion, O.
Eagle Wagon Wks., Auburn, N. Y.
Easton Car & Const. Co., Easton, Pa.
Galion All Steel Body Co., Galion, O.
Griscom-Russell Co., N. Y.
Heil Co., Milwaukee
Herr Dump Car Mfg. Co., Coatesville, Pa.
Hughes-Keenan Co., Mansfield, O.
The Hug Co., Highland, Ill.
Jennings Aut. Dump Body, Roanoke, Va.
Lee Trailer & Body Co., Plymouth, Ind.
Mack Trucks, Inc., N. Y.
Mandt Body Co., Keokuk, Ia.
Marion Steel Body Co., Marion, O.
Martin-Parry Corp., York, Pa.
N. Y. Central Ir. Wks., Hagerstown, Md.
Pechstein Iron Wks., Keokuk, Ia.
Stewart Iron Wks. Co., Cincinnati
Van Dorn Iron Wks. Co., Cleveland, O.

DUMP CARTS AND WAGONS, HORSE
*Austin-Western Road Machy. Co., Chicago
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
Acme Road Machy Co., Frankfort, N. Y.
Acme Wagon Co., Emigsville, Pa.
J. D. Adams & Co., Indianapolis
Austin Mfg. Co., Chicago
Bain Wagon Co., Kenosha, Wis.
Columbia Body Corp., Columbia, Pa.
Eagle Wagon Wks., Auburn, N. Y.
Gilbert Mfg. Co., Aberdeen, S. D.
G. H. Holsbog & Bro., Jeffersonville, Ind.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Little Red Wagon Co., Omaha, Neb.
Luedinghaus-Espenchied Wagon Co., St. Louis
Russell Grader Mfg. Co., Minneapolis
Smith Trailer Co., Syracuse, N. Y.
Stockland Road Machinery Co., Minneapolis
Streich Bros., Oshkosh, Wis.
Western Wheeled Scraper Co., Aurora, Ill.

DUMP WAGONS (ALL STEEL), TRACTOR DRAWN
*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Smith Trailer Co., Syracuse, N. Y.
Trail-IT Co., St. Paul, Minn.

DYNAMITE (See Explosives)

EARTH BORING EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.

EJECTORS, SEWAGE (See Sewage Ejectors)

ELECTRIC GENERATORS AND MOTORS
American Motors Co., Cedarburg, Wis.
The Louis Allis Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Crocker-Wheeler Co., Ampere, N. J.
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Ideal Electric & Mfg. Co., Mansfield, O.
Lincoln Electric Co., Cleveland, O.
Northwestern Mfg. Co., Milwaukee, Wis.
Robbins & Myers Co., Springfield, O.
Wagner Electric Mfg. Co., St. Louis
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC LAMPS
General Electric Co., Schenectady, N. Y.
Westinghouse Lamp Co., N. Y.

ELECTRIC LIGHTING PLANTS
Allis-Chalmers Mfg. Co., Milwaukee
Climax Eng. Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Fairbanks, Morse & Co., Chicago
Fuller & Johnson Mfg. Co., Madison, Wis.
General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York
Kohler Co., Kohler, Wis.
Klauer Mfg. Co., Dubuque, Iowa
Sunbeam Electric Mfg. Co., Evansville, Ind.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Kuhlman Electric Co., Bay City, Mich.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

ELECTRIC WIRES (See Wire)

ELEVATORS, BUCKET
*Atlas Engineering Co., Clintonville, Wis.
*Austin-Western Rd. Machy. Co., Chicago
*Chain Belt Co., Milwaukee, Wis.
*Conveying Weigher Co., N. Y.
*Fairfield Engineering Co., Marion, Ohio
*Good Rds. Machy. Co., Kennett Sq., Pa.
*Geo. Haiss Mfg. Co., N. Y.
*Industrial Brownhoist Corp., Cleveland
Abrams Cement Tool Co., Detroit
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, O.
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Co., Chicago
Littleford Bros., Cincinnati
New Holland Mch. Co., N. Holland, Pa.
Robins Convertible Belting Co., N. Y.
Spears-Wells Machy Co., Oakland, Cal.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Univ. Rd. Machy. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Worthington Pump & Mchy. Corp., N. Y.

ELEVATORS, PASSENGER, FREIGHT, ETC.
Am. Elev. & Mach. Co., Louisville, Ky.
Atlantic Elev. Co., Inc., Philadelphia
Bay State Elev. Co., Springfield, Mass.
Haughton Elev. & Mach. Co., Toledo, O.
Llewellyn Ir. Wks., Los Angeles, Cal.
Montgomery Elevator Co., Moline, Ill.
Otis Elevator Co., N. Y.
C. Ridgway & Son Co., Coatesville, Pa.
A. B. See Electric Elevator Co., N. Y.
Speidel Elevator Corp., Reading, Pa.
Warner Elevator Mfg. Co., Cincinnati
Warsaw Elevator Co., Warsaw, N. Y.
Westinghouse Elec. Elevator Co., E. Pittsburgh, Pa.

ENGINES, DREDGING
Murray Iron Works Co., Burlington, Ia.

ENGINES, GAS AND GASOLINE
*Caterpillar Tractor Co., San Leandro, Cal.
*Continental Motors Corp., Muskegon, Mich.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Electric Wheel Co., Quincy, Ill.
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Le Roi Co., Milwaukee
*Novo Engine Co., Lansing, Mich.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Allis-Chalmers Mfg. Co., Milwaukee
Beaver Mfg. Co., Milwaukee, Wis.
Buda Co., Harvey, Ill.
Charter Gas Engine Co., Sterling, Ill.
Chicago Pneumatic Tool Co., N. Y.
Climax Engineering Co., Clinton, Ia.
Cook Motor Co., Delaware, O.
Cushman Motor Works, Lincoln, Neb.
Ersted Mfg. Co., Portland, Ore.
Evinrude Motor Co., Milwaukee
Fairbanks Morse & Co., Chicago
Foos Gas Engine Co., Springfield, O.
Fuller & Johnson Mfg. Co., Madison, Wis.
Hinkley Motors, Inc., Detroit
F. Van Roosen Hoogendyk, New York
Ingersoll-Rand Co., New York
Minneapolis Steel & Machinery Co., Minneapolis, Minn.
Servel Mfg. Co., Evansville, Ind.
Sterling Engine Co., Buffalo, N. Y.
Universal Motor Co., Oshkosh, Wis.
Weber Engine Co., Kansas City, Mo.
Wisconsin Motor Mfg. Co., Milwaukee
Witte Engine Works, Kansas City, Mo.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, HOISTING (See Hoists)

ENGINES, INDUSTRIAL (See Power Plants, Industrial)

ENGINES, KEROSENE
*Electric Wheel Co., Quincy, Ill.
*Hercules Motors Corp., Canton, O.
*John Lauson Mfg. Co., New Holstein, Wis.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Climax Engineering Co., Clinton, Ia.
Fuller & Johnson Mfg. Co., Madison, Wis.
Witte Engine Works, Kansas City, Mo.

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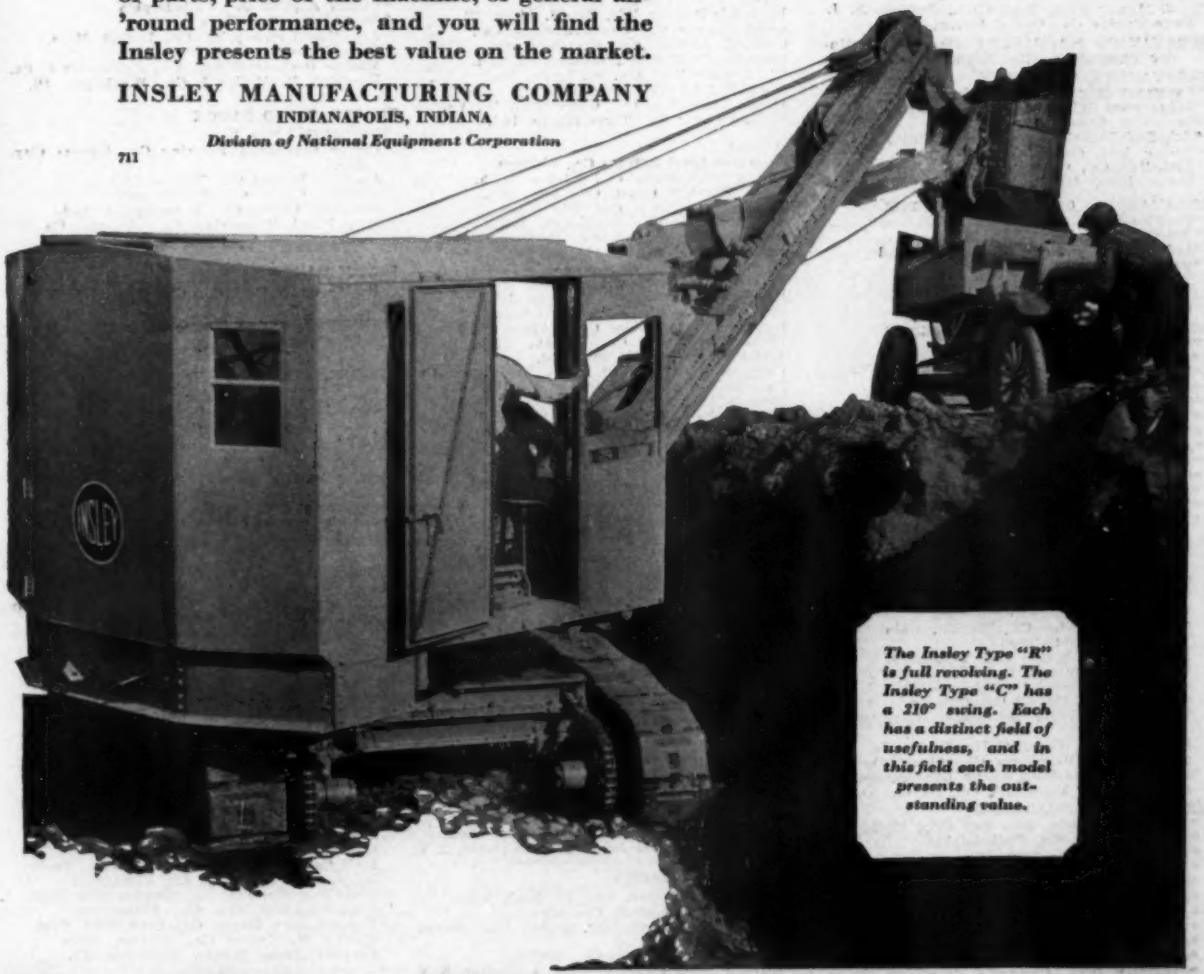
Price and Value

THE price of the Half-Yard Insley is only half the story. For that price you get the most modern in shovel construction, the very finest in material and workmanship, and performance in yards of dirt per day that gives you an entirely new conception of the possibilities of a half-yard shovel. And you can well afford to pay the price of a Half-Yard Insley.

Compare it to other machines in the half-yard field on a basis of efficient design, material, size of parts, price of the machine, or general all-'round performance, and you will find the Insley presents the best value on the market.

INSLEY MANUFACTURING COMPANY
INDIANAPOLIS, INDIANA
Division of National Equipment Corporation

711



The Insley Type "R" is full revolving. The Insley Type "C" has a 210° swing. Each has a distinct field of usefulness, and in this field each model presents the outstanding value.

INSLEY

Where to Purchase

ENGINES, OIL, DIESEL
*Stover Mfg. & Eng. Co., Freeport, Ill.
Allis-Chalmers Mfg. Co., Milwaukee
Anderson Engine & Fdry. Co., Anderson, Ind.
Bessemer Gas Eng. Co., Grove City, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buckeye Machinery Co., Lima, O.
Busch Sulzer Bros.-Diesel Eng. Co., St. Louis
Charter Gas Engineering Co., Sterling, Ill.
Chicago Pneumatic Tool Co., New York
De La Vergne Machinery Co., New York
Fairbanks, Morse & Co., Chicago
Fulton Iron Works Co., St. Louis
Ingersoll-Rand Co., New York
Lombard Governor Co., Ashland, Mass.
McIntosh & Seymour Corp., Auburn, N. Y.
Muncie Oil Engine Co., Muncie, Ind.
New London Ship & Eng. Co., Groton, Ct.
Nordberg Mfg. Co., Milwaukee, Wis.
St. Mary's Oil Eng. Co., St. Charles, Mo.
Taylor Machinery Co., Cleveland, O.
F. Van Rossen Hoogendyk, New York
Weber Engineering Co., Kansas City, Mo.
Western Machy. Co., Los Angeles, Cal.
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, PUMPING
*Hercules Motors Corp., Canton, O.
*Stover Mfg. & Eng. Co., Freeport, Ill.
*Waukesha Motor Co., Waukesha, Wis.
Allis-Chalmers Mfg. Co., Milwaukee
Climax Engineering Co., Clinton, Ia.
Hooven, Owens, Rentschler Co., Hamilton, O.
Murray Iron Works, Burlington, Ia.
Nordberg Mfg. Co., Milwaukee
Worthington Pump & Mchy. Corp., N. Y.

ENGINES, SWINGING
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
Dake Engine Co., Grand Haven, Mich.

EXCAVATING MACHINERY (See Names Under Excavators, also Steam Shovels)

EXCAVATORS, CABLEWAY
*Beaumont Mfg. Co., Philadelphia
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*Sauerman Bros., Inc., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
Ersted Mfg. Co., Portland, Ore.
Link-Belt Co., Chicago
Street Bros. Machinery Works, Chattanooga

EXCAVATORS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Trackson Co., Milwaukee, Wis.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
W. M. Blair Mfg. Co., Chicago, Ill.
Byers Machine Co., Ravenna, O.
General Excavator Co., Marion, Ohio

EXCAVATORS, DITCH AND TRENCH
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Geo. Haiss Mfg. Co., New York
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis, Ind.
*Keystone Driller Co., Beaver Falls, Pa.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Parsons Co., Newton, Ia.
*Thew Shovel Co., Lorain, O.
Austin Mach. Corpn., Muskegon, Mich.
Buckeye Tractor Ditcher Co., Findlay, O.
Byers Machine Co., Ravenna, O.
Cleveland Trencher Co., Euclid, O.
Economy Exc. Co., Iowa Falls, Ia.
Ersted Mfg. Co., Portland, Ore.
General Excavator Co., Marion, Ohio
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machinery Co., Chicago
Ohio Power Shovel Co., Lima, Ohio
Orton Crane & Shovel Co., Chicago
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machinery Co., Akron, O.
Street Bros. Machine Works, Chattanooga
C. T. Topping Machinery Co., Dayton, O.

EXCAVATORS, DRAG-LINE
*Bay City Shovels, Inc., Bay City, Mich.
*Beaumont Mfg. Co., Philadelphia
*Bucyrus-Erie Co., Erie, Pa.
*L. P. Green, Chicago
*Hayward Co., New York
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*Manitowoc Engr. Wks., Manitowoc, Wis.
*Osgood Company, Marion, Ohio
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
*Thew Shovel Co., Lorain, O.
Amer. Hoisting & Derrick Co., St. Paul
Austin Machy. Corp., Muskegon, Mich.
Byers Machine Co., Ravenna, O.
Economy Exc. Co., Iowa Falls, Ia.
Ersted Mfg. Co., Portland, Ore.
C. L. Gade, Iowa Falls, Ia.
General Excavator Co., Marion, Ohio
Gallon Iron Wks. & Mfg. Co., Gallon, O.
Harnischfeger Corp., Milwaukee, Wis.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, O.
Monighan Machine Co., Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Page Engineering Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Ia.
Star Drilling Machine Co., Akron, O.
Street Bros. Machine Works, Chattanooga

EXPANDED METAL
*Truscon Steel Co., Youngstown, O.
Berger Mfg. Co., Canton, Ohio
Consolidated Exp. Metal Co., Wheeling, W. Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Northwestern Exp. Metal Co., Chicago
Wheeling Corrugating Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

EXPANSION JOINT MATERIAL
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Philip Carey Co., Cincinnati, O.
*W. E. Meadows, Inc., Elgin, Ill.
*Truscon Steel Co., Youngstown, O.
Hoosier Asphalt Co., Alexandria, Ind.
Pioneer Asphalt Co., Lawrenceville, Ill.
Servised Products Corp., Chicago
Texas Co., New York
Waring-Underwood Co., Philadelphia

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Austin Powder Co., Cleveland, O.
Egyptian Powder Co., East Alton, Ill.
E. I. Du Pont De Nemours & Co., Wilmington, Del.
Equitable Powder Mfg. Co., E. Alton, Ill.
Giant Powder Co., San Francisco, Cal.
Grasselli Powder Co., Cleveland, O.
Hercules Powder Co., Wilmington, Del.
Ill. Powder Mfg. Co., St. Louis, Mo.
King Powder Co., Cincinnati, O.
Union Explosives Co., Clarksburg, W. Va.
U. S. Powder Co., Terre Haute, Ind.

FENCING
*American Steel & Wire Co., Chicago
Adrian Wire Fence Co., Adrian, Mich.
Amer. Fence & Const. Co., New York
Anchor Post Fence Co., New York
Cyclone Fence Co., Waukegan, Ill.
Dwiggins Wire Fence Co., Anderson, Ind.
Edwards Mfg. Co., Cincinnati
Ill. Wire & Mfg. Co., Joliet, Ill.
Ind. Steel & Wire Co., Muncie, Ind.
Interlocking Fence Co., Morton, Ill.
Keystone Steel & Wire Co., Peoria, Ill.
Kokomo Steel & Wire Co., Kokomo, Ind.
Mich. Wire Fence Co., Adrian, Mich.
Nitselman Bros., Muncie, Ind.
Page Stl. & Wire Prod. Corp., Bridgeport, Ct.
Pittsburgh Steel Co., Pittsburgh, Pa.
Stewart Ir. Wks. Co., Cincinnati, O.
Tex. Cyclone Fence Co., Ft. Worth, Tex.
Van Dorn Iron Works Co., Cleveland, O.
Wayne Iron Works, Wayne, Pa.
Wickwire-Spencer Steel Co., New York

FILING EQUIPMENT, STEEL
Art Metal Constr. Co., Jamestown, N. Y.
Berger Mfg. Co., Canton, O.
Canton Art Metal Co., Canton
Gen. Fireproofing Co., Youngstown, O.
Van Dorn Iron Works Co., Cleveland, O.

FILTERS, OIL
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.

FILTERS, WATER
Amer. Water Softener Co., Philadelphia, Pa.
Cochran Corp., Philadelphia, Pa.
Graver Corporation, E. Chicago, Ind.
International Filter Co., Chicago
Norwood Engineering Co., Florence, Mass.
Roberts Filter Co., Darby, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

FINISHING MACHINES, CONCRETE ROAD (See Concrete Road Finishers)

FIRE & POLICE ALARM SYSTEMS
Eagle Signal Sales Corp., Moline, Ill.
Gamewell Co., Newton Upper Falls, Mass.
Sterling Siren Fire Alarm Co., Rochester, N. Y.

FIRE ALARM SIRENS
Erick Electric Siren Co., St. Paul, Minn.
Federal Sign System, Chicago
Hendrie & Bolthoff Mfg. & Sup Co., Denver, Colo.
Holtzer-Cabot Electric Co., Boston
Sterling Siren Fire Alarm Co., Rochester, N. Y.
Union Water Meter Co., Worcester, Mass.

FIRE APPARATUS, MOTOR
Ahrens-Fox Fire Eng. Co., Cincinnati, Ohio
Amer-La France & Foamite Corp., New York
Boyer Fire Apparatus Co., Logansport, Ind.
Brockway Motor Fire Apparatus Co., Cortlandt, N. Y.
Buffalo Fire Appl. Corp., Buffalo, N. Y.
Hale Fire Pump Co., Conshohocken, Pa.
Mack Trucks, Inc., New York
Northern Fire Apparatus Co., Minneapolis, Minn.
Peter Pirsch & Sons Co., Kenosha, Wis.
Prospect Fire Engine Co., Prospect, Ohio
Seagrave Co., Columbus, Ohio
Waterous Fire Eng. Works, St. Paul, Minn.
White Co., Cleveland

FIRE HOSE (See Hose, Fire)

FLEXIBLE JOINTS
*Central Foundry Co., New York
*U. S. C. I. Pipe & Fndry Co., Burlington, N. J.
Coldwell-Wilcox Co., Newburgh, N. Y.
Crane Co., Chicago
United Lead Company, New York

FLOOD LIGHTING PROJECTORS
B. B. T. Corp., Philadelphia, Pa.
Crouse-Hinds Co., Syracuse, N. Y.
General Electric Co., Schenectady
Sperry Gyroscope Co., Brooklyn, N. Y.

FLOOD LIGHTS, PORTABLE
*Alexander Milburn Co., Baltimore
*National Carbide Sales Corp., New York
*Oxweld Acetylene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

FLOORING, COMPOSITION
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
Am. Mason Safety Tr. Co., Lowell, Mass.
Johns-Manville, Inc., New York
Marine Decking & Sup. Co., Philadelphia, Pa.
Franklyn R. Muller & Co., Waukegan, Ill.

FLOORS, WOOD BLOCK
*Barrett Co., New York
Carter Bloxonend Flooring Co., Kansas City, Mo.
Jennison-Wright Co., Toledo, Ohio
Midland Creos. Co., Toledo, Ohio
Republic Creos. Co., Indianapolis, Ind.
Sou. Wood Preserving Co., Atlanta, Ga.
Wyckoff Pipe & Creos. Co., New York

FLUSH TANKS
Pacific Flush Tank Co., Chicago and N. Y.

FLUSHERS, STREET (See Street Flushers and Sprinklers)

FORGES, OIL (Rivet Heating)
Hauck Mfg. Co., Brooklyn, N. Y.
Mead-Morrison Mfg. Co., E. Boston

FORMS, CONCRETE ROAD
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Truscon Steel Co., Youngstown, Ohio
Hotchkiss Stl. Products Co., Binghamton, N. Y.
Metal Forms Corp., Milwaukee

FORMS, CONCRETE PIPE
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Steel Form & Iron Co., Warren, O.
Concrete Form Co., Syracuse, N. Y.
Eclipse Mach. Co., Kendallville, Ind.
Martin Iron Works, Los Angeles, Cal.
Quinn Wire & Iron Works, Boone, Iowa

FORMS, MANHOLE, PIPE, SEWER, ETC.
*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

FORMGRADERS
Ted Carr & Co., Chicago

FOUNTAINS, DRINKING
Jas. B. Clow & Sons, Chicago
Crane Co., Chicago
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Murdock Mfg. & Sup. Co., Cincinnati
Puro San. Dr. Ftn. Co., Haydenville, Mass.
Rundle-Spence Mfg. Co., Milwaukee
Stewart Iron Works Co., Cincinnati, Ohio
Halsey W. Taylor Co., Warren, Ohio
Century Brass Works, Belleville, Ill.

FRESNOES (See Scrapers, Rotary)

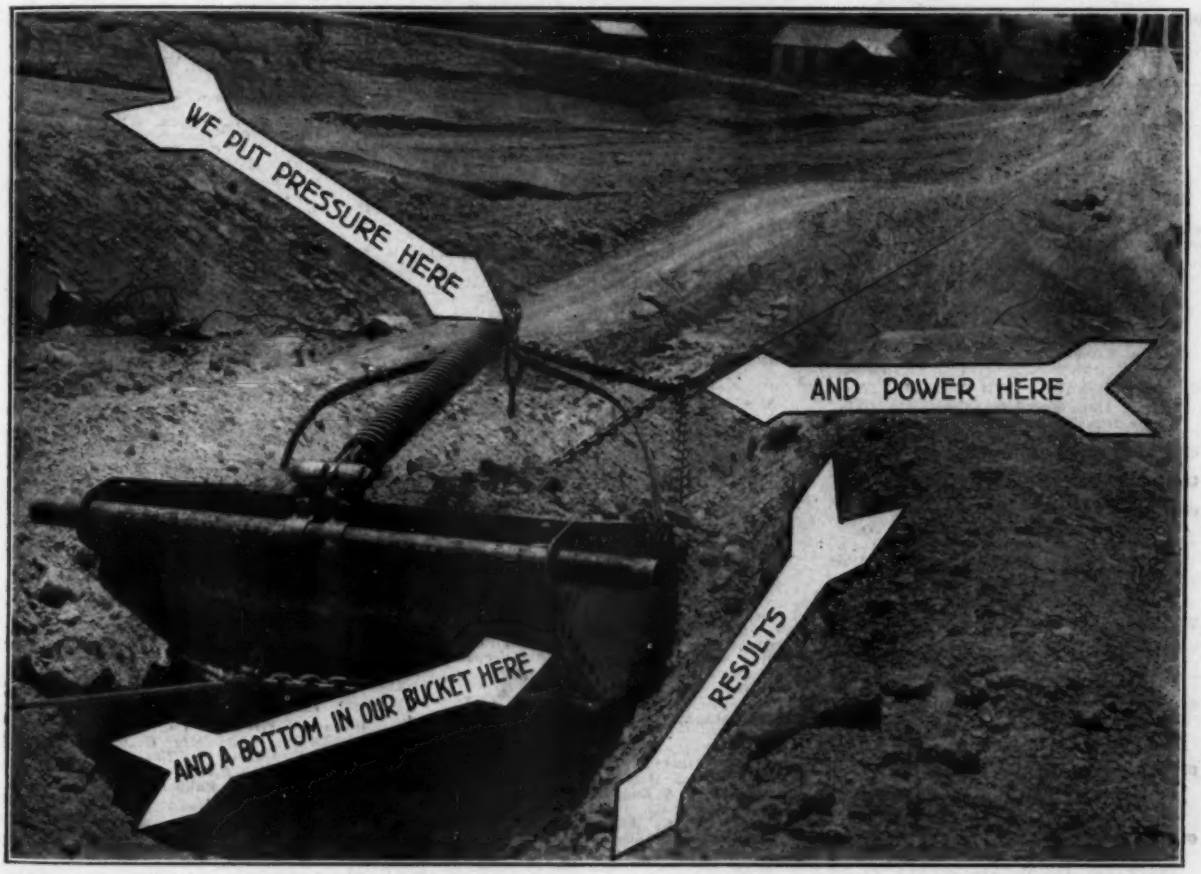
GAGES, WATER LEVEL
Bristol Co., Waterbury, Conn.
Builders Iron Foundry, Providence, R. I.
W. & L. E. Gurley, Troy, N. Y.
Lunkenheimer Co., Cincinnati, Ohio
Simplex Valve & Meter Co., Phila.
Walworth Mfg. Co., Boston

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

SCHOFIELD—BURKETT EXCAVATOR

THIS IS WHY

SCHOFIELD-BURKETT CABLE DRAG LINE SYSTEMS HAVE DRAWN SUCH FAVORABLE COMMENT DURING THE PAST TWENTY YEARS FROM USERS IN TWENTY-EIGHT STATES AND CANADA.



WE DIG a BIG LOAD and DELIVER IT at the PROPER DESTINATION

OUR ENGINEERS ARE ALL MEN WITH FIELD EXPERIENCE AND KNOW FROM PRACTICAL KNOWLEDGE JUST WHAT IS REQUIRED OF A CABLE DRAG LINE. WE BUILD THEM ACCORDINGLY.

SCHOFIELD-BURKETT CONSTRUCTION COMPANY

MACON, GEORGIA

Eastern Sales Office:

150-02 Sixth Avenue, Whitestone, N. Y.

Where to Purchase

GARBAGE CANS (See Cans)

GARBAGE COLLECTION EQUIPMENT
*Highway Trailer Co., Edgerton, Wis.
Atlas Sales Corp., New York City
Detroit Trailer & Mach. Co., Detroit
Freuhauf Trailer Co., Detroit, Mich.
Heil Co., Milwaukee
Geo. H. Holsbog & Bros., Jeffersonville, Ind.
Lee Trailer & Body Co., Plymouth, Ind.
Littleford Bros., Cincinnati
B. Nicoll & Co., New York
Smith Trailer Co., Syracuse, N. Y.
Troy Trailer & Wagon Co., Troy, Ohio

GARBAGE DISPOSAL SYSTEMS
American Beccari Corp., New York
C. O. Bartlett & Snow Co., Cincinnati
Decarie Incinerator Co., L. I. City, N. Y.
Goder Incinerator Corp., Chicago
Hiler Eng. & Const. Co., Brooklyn, N. Y.
Morse-Boulger Destructor Co., New York
Nye Odorless Crematory Co., Macon, Ga.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Superior Incinerator Co. of Dallas, Dallas, Tex.

GASOLINE STORAGE TANKS
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Wm. B. Scaife & Sons, Pittsburgh, Pa.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
United Iron Works, Inc., Kansas City, Mo.
Wayne Co., Fort Wayne, Ind.

GATES, SLUICE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., Boston, Mass.
Coldwell-Wilcox Co., Newburgh, N. Y.
R. Hardesty Mfg. Co., Denver
Rodney Hunt Machine Co., Orange, Mass.
Ludlow Valve Mfg. Co., Troy, N. Y.

GATES FOR PARKS AND CEMETERIES
Stewart Iron Works Co., Cincinnati, Ohio
Wayne Iron Works, Wayne, Pa.

GLASS, FIREPROOF (See Wire Glass)

GRADERS, ROAD (See Road Graders)

GRADER BLADES
*General Wheelbarrow Co., Cleveland, O.
J. D. Adams & Co., Indianapolis, Ind.
Galion Ir. Works & Mfg. Co., Galion, Ohio
Russell Grader Mfg. Co., Minneapolis
Shunk Mfg. Co., Bucyrus, Ohio

GRAND STANDS, PORTABLE
Circle-A. Prod. Corp., Newcastle, Ind.
Leavitt Mfg. Co., Urbana, Ill.
Wayne Iron Works, Wayne, Pa.

GRATING, STEEL
*Blaw-Knox Co., Pittsburgh
Hendrick Mfg. Co., Carbondale, Pa.

GREASE
*D-A Lubricant Co., Inc., Indianapolis
*Jos. Dixon Crucible Co., Jersey City, N. J.

GRIZZLIES
Allis-Chalmers Mfg. Co., Milwaukee
Austin Mfg. Co., Chicago
Robins Conv. Belt Co., New York
Smith Engineering Works, Milwaukee
Stephens-Adamson Mfg. Co., Angora, Ill.

GUARD RAIL, HIGHWAY
*Am. Steel & Wire Co., Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
Cyclone Fence Co., Waukegan, Ill.
W. S. Godwin Co., Baltimore, Md.
Hazard Wire Rope Co., Wilkesbarre, Pa.
J. H. Ramsey, Albany, N. Y.
W. F. Robertson Stl. & Iron Co., Cincinnati
Stewart Iron Works Co., Cincinnati
Wickwire-Spencer Steel Co., New York

HAMMERS, STEAM, PILE (See Pile Hammers, Steam)

HEATING KETTLES (See Kettles)

HITCHES
*Gustav Schaefer Co., Cleveland, Ohio
Detroit Trailer & Machine Co., Detroit
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

HOISTS, BELT-DRIVEN
*Amer. Saw Mill Mchy. Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Engine & Pump Co., Shippensburg, Pa.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
American Hoist & Derrick Co., St. Paul, Minn.
Mead-Morrison Mfg. Co., Boston, Mass.
Street Bros. Mach. Works, Chattanooga
Universal Hoist & Mfg. Co., Cedar Falls, Ia.
Weller Mfg. Co., Chicago
William Hoist Co., Los Angeles, Calif.

HOISTS, CONCRETE, TOWER
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Eng. Co., Cleveland, Ohio
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
English Bros. Machy Co., Kansas City
Mead-Morrison Mfg. Co. ,Boston
Street Bros. Mach. Works, Chattanooga

HOISTS, ELECTRIC
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Dobbie Fdry. & Mach. Co., Niagara Falls
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Industrial Brownhoist Corp., Cleveland
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sterling Machinery Corp., Kansas City, Mo.
*Sullivan Machy. Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Chisholm-Moore Co., Cleveland, Ohio
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Norris K. Davis San Francisco, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Ersted Mfg. Co., Portland, Ore.
Harnischfeger Corp., Milwaukee
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Northern Engineering Works, Detroit
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Vulcan Iron Works, Wilkes-Barre, Pa.
Williams Hoist Co., Los Angeles, Calif.

HOISTS, GASOLINE
*Amer. Cement Mach. Co., Inc., Keokuk, Iowa
*Amer. Saw Mill Mchy Co., Hackettstown, N. J.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee
*Clyde Iron Works Sales Co., Duluth, Minn.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*S. Flory Mfg. Co., Bangor, Pa.
*Lansing Co., Lansing, Mich.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Nove Engine Co., Lansing, Mich.
*O. K. Clutch & Mach. Co., Columbia, Pa.
*Sterling Machinery Corp., Kansas City, Mo.
Am. Hoist & Derrick Co., St. Paul, Minn.
Amer. Mfg. & Eng. Co., Kalamazoo, Mich.
Austin Mfg. Co., Chicago
Beach Mfg. Co., Charlotte, Mich.
Buffalo Hoist & Derrick Co., Buffalo, N. Y.
Construction Machy. Co., Waterloo, Ia.
Dake Eng. Co., Grand Haven, Mich.
Dyrr Mfg. Co., Huntington Park, Calif.
Norris K. Davis San Francisco, Calif.
English Bros. Machy. Co., Kansas City, Mo.
Ersted Mfg. Co., Portland, Ore.
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Universal Hoist & Mfg. Co., Cedar Falls, Iowa
Williams Hoist Co., Los Angeles, Calif.

HOISTS, HAND
*Beebe Bros., Inc., Seattle, Wash.
*Dobbie Fdy. & Machine Co., Buffalo, N. Y.

HOISTS, PNEUMATIC
*Independent Pneu. Tool Co., Chicago, Ill.
*Sullivan Machy. Co., Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneumatic Mchy. Co., St. Louis
Dake Eng. Co., Grand Haven, Mich.
Detroit Hoist & Mach. Co., Detroit
Gardner-Denver Co., Quincy, Ill.
Gilman Mfg. Co., E. Boston, Mass.
Hanna Engineering Works, Chicago
Ingersoll-Rand Co., New York
Mead-Morrison Mfg. Co., Boston
Northern Eng. Works, Detroit, Mich.
Worthington Pump & Mchy. Corp., N. Y.

HOISTS, PORTABLE
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*C. H. & E. Mfg. Co., Milwaukee, Wis.
Ersted Mfg. Co., Portland, Ore.
Joliet Mfg. Co., Joliet, Ill.
Jas. B. Seaverns Co., Batavia, Ill.

HOISTS, STEAM
*Clyde Iron Works Sales Co., Duluth, Minn.
*S. Flory Mfg. Co., Bangor, Pa.
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*J. S. Mundy Hstg. Engine Co., Newark, N. J.
*Sullivan Machinery Co., Chicago
Am. Hoist & Derrick Co., St. Paul, Minn.
Dake Eng. Co., Grand Haven, Mich.
Hardie-Tynes Mfg. Co., Birmingham, Ala.
Ingersoll-Rand Co., New York
Mead-Morrison Mfg. Co., Boston
National Hoisting Eng. Co., Harrison, N. J.
Orr & Sembower, Reading, Pa.
Street Bros. Mach. Works, Chattanooga
Thomas Elevator Co., Chicago
Treadwell Engineering Co., Easton, Pa.

HOISTS FOR MOTOR TRUCKS
*Beebe Bros., Inc., Seattle, Wash.
*Brown Clutch Co., Sandusky, Ohio
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*Wood Hydr. Hoist & Body Co., Detroit
Atlas Sales Corp., New York
Ersted Mfg. Co., Portland, Ore.
Heil Co., Milwaukee
Hydr. Hoist Mfg. Co., St. Paul, Minn.
Joliet Mfg. Co., Joliet, Ill.
Van Dorn Iron Works Co., Cleveland, Ohio

HOPPERS, CONCRETE (Aggregate Measuring)
*Blaw-Knox Company, Pittsburgh, Pa.
*Butler Bin Co., Waukesha, Wis.
*Erie Steel Const'n Co., Erie, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
C. S. Johnson Co., Champaign, Ill.
Jas. B. Seaverns Co., Batavia, Ill.
Superior Engineering Co., Warren, Ohio

HOSE, AIR
*The Buhl Company, Chicago
*Independent Pneu. Tool Co., Chicago
Chicago Pneumatic Tool Co., New York
Cincinnati Rubber Mfg. Co., Cincinnati
Cleveland Rock Drill Co., Cleveland, Ohio
The Dallett Co., Philadelphia, Pa.
Gilman Mfg. Co., East Boston, Mass.
Goodyear Tire & Rubber Co., Akron, Ohio
Ingersoll-Rand Co., New York
Mulconroy Co., Inc., Philadelphia, Pa.
Penna. Flexible Metallic Tubing Co., Phila., Pa.
Republic Rubber Co., Youngstown, Ohio
United States Rubber Co., New York

HOSE, FIRE
Bi-Lateral Fire Hose Co., Chicago
Eureka Fire Hose Mfg. Co., New York
Fabric Fire Hose Co., New York
B. F. Goodrich Rubber Co., Akron, Ohio
Goodyear Tire & Rubber Co., Akron, Ohio

HOUSE NUMBERS
Hamilton Metal Prod. Co., Hamilton, Ohio
O. H. Hanson Co., Chicago
Niagara Metal Stamping Corp., Niagara Falls, N. Y.

HOUSES, PORTABLE (See Portable Buildings)

HYDRANTS, FIRE
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Columbian Ir. Works, Chattanooga, Tenn.
Darling Valve & Mfg. Co., Williamsport, Pa.
Eddy Valve Co., Waterford, N. Y.
Iowa Valve Co., Oskaloosa, Iowa
Kennedy Valve Mfg. Co., Elmira, N. Y.
Ludlow Valve Mfg. Co., Troy, N. Y.
Michigan Valve & Fdry. Co., Detroit
Norwood Eng. Co., Florence, Mass.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., E. Orange, N. J.
Vogt Bros Mfg. Co., Louisville, Ky.
Waterous Co., St. Paul
R. D. Wood & Co., Philadelphia, Pa.

HYDRAULIC RAMS
Deming Co., Salem, Ohio

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

HELTZEL

Weighing Plant Springless Scale Type

Kept Two 27-E Pavers Running Full Capacity

Note the simplicity of the American Kron Springless Scales as used on Heltzel Bins. No poises, counterweights, auxiliary dials or complicated mechanism to confuse the operator. A large 3-foot dial, easily read from any position on the platform, is his guide.

Material is weighed and loaded faster than the trucks can carry it away. It was this ease of handling and speed of operation that caused York Engineering Co. to be enthusiastic about this modern weighing plant.

On the York job two 27-E Pavers were kept going at full capacity on an 18-foot road 9 inches in depth and 11 miles long.

It is performance of this kind that reduces the costs on road jobs—that turns possible loss into gain, and increases the scope of contractors' operations. Write for details.

Heltzel Curb and Gutter Forms

Heltzel Sidewalk Forms

"The Heltzel way is the correct weigh"

The HELTZEL Steel Form & Iron Company

Warren, Ohio

Send us proof of Speed, Accuracy and Dependability of the Heltzel Weighing Plant

Name.....

Address.....

City .....

CEM 7-29

Where to Purchase

Johnson Mfg. Co., Seattle, Wash.
Rife Hydraulic Engine Co., New York
Ramsey Pump Co., Seneca Falls, N. Y.

IGNITION SYSTEMS
*Eisemann Magneto Corp., New York
American Bosch Magneto Corp., Springfield, Mass.
Dayton Eng. Lab. Co., Dayton, Ohio
Splitdorf Electric Co., Newark, N. J.

INCINERATORS, GARBAGE (See Garbage Disposal)

INDICATOR POSTS (See Valves)

INSPECTING LABORATORIES
*Conard & Busby, Burlington, N. J.
*Robert W. Hunt Co., Chicago, Ill.
*Patzig Testing Laboratories, Des Moines, Ia.
Allentown Testing Laboratory, Allentown, Pa.
E. L. Conwell & Co., Philadelphia, Pa.
Gulick-Henderson Co., New York
New York Testing Lab., New York
Pittsburgh Testing Lab., Pittsburgh

INSTRUMENTS AND SUPPLIES (Surveyors' and Engineers')
Wm. Ainsworth & Sons, Denver, Col.
L. Beckman Co., Toledo, Ohio
C. L. Berger & Sons, Boston
Brandis & Sons Mfg. Co., Brooklyn, N. Y.
Buff & Buff Mfg. Co., Boston
Eugene Dietzgen Co., Chicago
W. & L. E. Gurley, Troy, N. Y.
Keuffel & Esser Co., Hoboken, N. J.
Kolesch & Co., New York
A. Lietz Co., San Francisco
Leupold-Voipel & Co., Portland, Ore.
Lufkin Rule Co., Saginaw, Mich.
Warren-Knight Co., Philadelphia, Pa.
F. Weber & Co., Philadelphia, Pa.
David White Co., Milwaukee, Wis.

INTEGRAL CURB AND BASE FORMS (See Forms, Concrete)

IRON WORK, STRUCTURAL AND ORNAMENTAL, (See Bridges and Buildings)

JACKS, LIFTING
*McKiernan-Terry Drill Co., New York
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Joyce-Cridland Co., Dayton, Ohio
A. O. Norton, Inc., Moline, Ill.
Oil Jack Co., New York
Ross Mfg. Co., Pittsburgh, Pa.
Watson-Stillman Company, New York

JACKS, PIPE FORCING
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh, Pa.
Easy Mfg. Co., Lincoln, Neb.

JAIL AND PRISON WORK
Fries & Son Steel Const. & Eng. Co., Covington, Ky.
Manly Jail Works, Dalton, Ga.
Manly Jail Building Co., St. Louis, Mo.
Southern Prison Co., San Antonio, Tex.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

JOINTS, EXPANSION PAVING (See Expansion Joint Material)

JOINTS, FLEXIBLE PIPE (See Flexible Joints)

JOISTS, STEEL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Genfire Steel Co., Youngstown, Ohio
Ingalls Steel Prod. Co., Birmingham, Ala.

KETTLES, FOR ASPHALT AND TAR
*Barber Asphalt Co., Philadelphia, Pa.
*Chanute Oil Burner Co., Elkhart, Ind.
*Connery & Co., Inc., Philadelphia, Pa.
*Good Roads Mchy. Co., Kennett Square, Pa.
*Jos. Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Acme Rd. Mach. Co., Frankfort, N. Y.
Aeroil Burner Co., West New York, N. J.
Beach Mfg. Co., Charlotte, Mich.
Charleroi Iron Wks., Charleroi, Pa.
Chase & Lyman, Boston, Mass.
Hauck Mfg. Co., Brooklyn, N. Y.
Kinney Mfg. Co., Boston, Mass.
Lancaster Iron Works, Inc., Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Macleod Co., Cincinnati, Ohio
Spears-Wells Mchy. Co., Oakland, Cal.
G. L. Stuebner Ir. Wks., Inc., Long Island City, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.
Universal Rd. Mach. Co., Kingston, N. Y.

LANTERNS, CONTRACTORS'
*E. B. Dietz Co., New York
*Alex. Milburn Co., Baltimore, Md.
*National Carbide Sales Corp., New York
Defiance Lantern & Stamping Co., Rochester, N. Y.
Economy Electric Lantern Co., Chicago
Handlan, Buck Mfg. Co., St. Louis
National Carbon Co., Inc., New York City
Star Headlight & Lantern Co., Rochester, N. Y.

LATH, METAL
*Truscon Steel Co., Youngstown, Ohio
Berger Mfg. Co., Canton, Ohio
Bostwick Steel Lath Co., Niles, Ohio
Consolidated Exp. Metals Co., Wheeling, W.Va.
Decatur Cornice & Roofing Co., Albany, Ala.
Edwards Mfg. Co., Cincinnati
Genfire Steel Co., Youngstown, Ohio
Milwaukee Corr. Co., Milwaukee, Wis.
Northwestern Exp. Metal Co., Chicago
Penn. Metal Co., Boston, Mass.
St. Paul Corr. Co., St. Paul, Minn.
Sykes Metal Lath and Roofing Co., Niles, O.
Wheeling Corr. Co., Wheeling, W. Va.
Youngstown Pressed Steel Co., Warren, O.

LAWN MOWERS
Chadborn & Coldwell Mfg. Co., Newburgh, N.Y.
Coldwell Lawn Mower Co., Newburgh, N. Y.
Gilson Mfg. Co., Port Washington, Wis.
Ideal Power Lawn Mower Co., Lansing, Mich.
Jacobson Mfg. Co., Racine, Wis.
Modern Mach. Works, Milwaukee
Penna. Lawn Mower Works, Philadelphia, Pa.
Phila. Lawn Mower Co., Philadelphia, Pa.
S. P. Townsend Co., Bloomfield, N. J.
Worthington Mower Co., Stroudsburg, Pa.

LAWN MOWER SHARPENERS
Fate-Root-Heath Co., Plymouth, Ohio

LEAD-MELTING FURNACES
Aeroil Burner Co., West New York, N. J.
Chicago Flexible Shaft Co., Chicago
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros., Cincinnati, Ohio
A. P. Smith Mfg. Co., East Orange, N. J.

LETTERING GUIDES
Wood-Regan Inst. Co., So. Orange, N. J.

LIGHTS, ACETYLENE
*Alex Milburn Co, Baltimore, Md.
*Natl. Carbide Sales Corp., New York
*Oxweld Acytalene Co., New York
General Electric Co., Schenectady, N. Y.
Kohler Co., Kohler, Wis.
Westinghouse El. & Mfg. Co., E. Pittsburgh, Pa.

LIGHTING STANDARDS (See Street Lamp Posts)

LIGHTS, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio
National Carbon Co., New York

LIQUID CHLORINE
Arnold, Hoffman & Co., Inc., New York
Electro Bleaching Gas Co., New York
Hooker Electrochemical Co., New York
Mathieson Alkali Works, Inc., New York
Penna. Salt Mfg. Co., Philadelphia, Pa.

LOADERS, GRAVEL, WAGON, CAR, ETC.
*Atlas Engineering Co., Clintonville, Wis.
*Barber-Greene Co., Aurora, Ill.
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Burch Corp., Crestline, Ohio
*Chicago Automatic Conv. Co., Chicago
*Fairfield Engineering Co., Marion, Ohio
*Geo. Haiss Mfg. Co., N. Y.
*Holtzel St. Form & Ir. Co., Warren, Ohio
*Industrial Brownhoist Corp., Cleveland
*Nelson Iron Works, Passaic, N. J.
*Sauerman Bros., Chicago
*Trackson Co., Milwaukee, Wis.
Bonney Supply Co., Inc., Rochester, N. Y.
Conant Mach. Co., Concord Junct., Mass.
P-S Mfg. Co., New Holstein, Wis.
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hughes-Keenan Co., Mansfield, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Kent Machine Co., Kent, Ohio
Lee Trailer & Body Co., Plymouth, Ind.
Link-Belt Co., Chicago
Logan Co., Louisville, Ky.
New Holland Mch. Co., N. Holland, Pa.
Northern Conveyor Co., Janesville, Wis.
Portable Machinery Co., Clifton, N. J.
H. B. Sackett Screen & Chute Co., Chicago
Spears-Wells Mchy. Co., Oakland, Cal.
Specialty Engineering Co., Philadelphia, Pa.
Star Drilling Mach. Co., Akron, Ohio
Universal Rd. Mach. Co., Kingston, N. Y.
Weller Mfg. Co., Chicago

LOCKERS, STEEL
All-Steel Equip. Co., Aurora, Ill.
Berger Mfg. Co., Canton, Ohio
Durabilt Steel Locker Co., Aurora, Ill.
Durand Steel Locker Co., Chicago
Hart & Hutchinson Co., N. Britain, Conn.
Lyon Metallic Mfg. Co., Aurora, Ill.
Fred. Medart Mfg. Co., St. Louis, Mo.
Narragansett Mach. Co., Providence, R. I.

LOCOMOTIVES, FOR CONTRACTORS, ETC.
*Brookville Locomotive Co., Brookville, Pa.
Baldwin Loc. Works, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio
Davenport Loc. Works, Davenport, Iowa
Heisler Locomotive Works, Erie, Pa.
Lima Loc. Works, Lima, Ohio
Mid-West Locomotive Works, Cincinnati
Milwaukee Loc. Mfg. Co., Milwaukee
H. K. Porter Co., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Geo. D. Whitcomb Co., Rochelle, Ill.

LUBRICANTS
*D-A Lubricant Co., Indianapolis, Ind.
*Joseph Dixon Crucible Co., Jersey City, N. J.
Texas Co., New York

LUBRICATORS
The Bassick Mfg. Co., Chicago
Carr Fastener Co., Cambridge, Mass.

MANGANESE STEEL PRODUCTS
American Maganese St. Co., Chicago H'ts., Ill.
Taylor-Wharton Ir. & St. Co., High Bridge, N.J.

MANHOLE COVERS (See Castings)

METAL LATH (See Lath)

METAL ROOFING (See Roofing)

METER BOXES
Builders Iron Foundry, Providence, R. I.
H. W. Clark Co., Mattoon, Ill.
Clarksville Fdry. & Mach. Co., Clarksville, Tenn.
J. B. Clow & Sons, Chicago
Columbian Iron Works, Chattanooga, Tenn.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
J. S. Schofield's Sons Co., Macon, Ga.

METER COUPLINGS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Hersey Mfg. Co., So. Boston, Mass.
Mueller Co., Decatur, Ill.
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Union Water Meter Co., Worcester, Mass.

METER TESTERS
*Neptune Meter Co., New York
H. W. Clark Co., Mattoon, Ill.
Ford Meter Box Co., Wabash, Ind.
Mueller Co., Decatur, Ill.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.

METERS, ELECTRIC (WATTHOUR)
Duncan Elec. Mfg. Co., LaFayette, Ind.
General Electric Co., Schenectady, N. Y.
Sangamo Electric Co., Springfield, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

METERS, WATER, OIL & GASOLINE
*Neptune Meter Co., New York
Badger Meter Mfg. Co., Milwaukee
Buffalo Meter Co., Buffalo, N. Y.
Federal Meter Corp., E. Orange, N. J.
Gamon Meter Co., Newark, N. J.
Hersey Mfg. Co., Boston, Mass.
National Meter Co., New York
Pittsburgh Equitable Meter Co., Pittsburgh, Pa.
Phoenix Meter Co., Prince Bay, St. Isl., N. Y.
Thomson Meter Corp., New York
Union Water Meter Co., Worcester, Mass.
Worthington Pump & Mchy. Corp., New York

METERS, WATER (VENTURI TYPE)
Builders Iron Fdry., Providence, R. I.
Simplex Valve & Meter Co., Philadelphia, Pa.

MIXERS, CONCRETE (See Concrete Mixers)

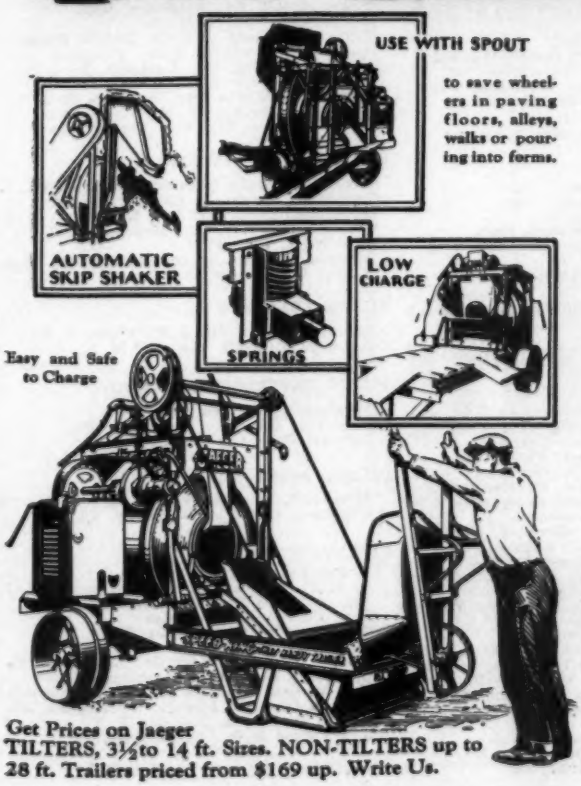
MIXERS, GROUT
*Lakewood Eng. Co., Cleveland, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
Kent Mach. Co., Cuyahoga Falls, Ohio
T. L. Smith Co., Milwaukee, Wis.

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

This All-Purpose Mixer has earned its name SPEED-KING

One Man End Control!

Famous Jaeger One-Bag Mixer with End Discharge ∽ Built of Steel ∽ Fast ∽ Portable ∽ Easy to Handle


USE WITH SPOUT
to save wheelers in paving floors, alleys, walks or pouring into forms.
AUTOMATIC SKIP SHAKER
SPRINGS
LOW CHARGE
Easy and Safe to Charge

Get Prices on Jaeger TILTERS, 3½ to 14 ft. Sizes. NON-TILTERS up to 28 ft. Trailers priced from $169 up. Write Us.

IT takes only 5 seconds to charge, and 7 to 10 seconds to discharge this mixer. It needs only about 6 feet of street room. It's *spring mounted* on two roller bearing wheels with dual tires (for soft ground and pavements); it's 50% stronger and ½ ton lighter because it's built of steel.

In other words, here's a *fast, compact, portable, sturdy* one-bag trailer with all the special Jaeger features that make Jaeger the world's leader in mixer sales. Check the points here illustrated on this machine. They tell the story.

You can buy this mixer at a price under the market. And back of it is the quick, reliable service of over 100 Jaeger stations in principal cities and towns.

Ask us also about Handy 3½ S Trailer for $169 up.

— Mail this slip for Catalog and New Prices —

THE JAEGER MACHINE COMPANY.
701 Dublin Ave., Columbus, Ohio

Please send catalog, prices and terms on
NON-TILTS TILTING MIXERS
PLASTER MIXERS

Name _____

Address _____

_____

Do you mention the CONTRACTORS AND ENGINEERS MONTHLY when writing? Please do.

Where to Purchase

MIXERS, MORTAR

*Atlas Engineering Co., Clintonville, Wis.
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Heltzel St. Form & Ir. Co., Warren, Ohio
*Jaeger Machine Co., Columbus, Ohio
*Lakewood Eng. Co., Cleveland, Ohio
*Lansing Co., Lansing, Mich.
*John Lauson Mfg. Co., New Holstein, Wis.
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Anchor Mfg. Co., Chicago
Archer Iron Works, Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Kent Machine Co., Kent, Ohio
Kiel Machine Co., Kiel, Wis.
Knickerbocker Co., Jackson, Mich.
Meili-Blumberg Co., New Holstein, Wis.
T. L. Smith Co., Milwaukee, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MIXERS, PLASTER

*Atlas Engineering Co., Clintonville, Wis.
*Conveying Weighar Co., N. Y.
*Jaeger Machine Co., Columbus, Ohio
*John Lauson Mfg. Co., New Holstein, Wis.
Anchor Mfg. Co., Chicago
Blystone Mfg. Co., Cambridge Spgs., Pa.
Construction Machy. Co., Waterloo, Iowa
Norris K. Davis, San Francisco, Calif.
Essick & Co., Los Angeles, Cal.
Knickerbocker Co., Jackson, Mich.
Meili-Blumberg Co., New Holstein, Wis.
Standard Scale & Sup. Corp., Pittsburgh
Talbot-Flood Mfg. Co., Kansas City, Mo.

MORTAR BOXES

*Blaw-Knox Co., Pittsburgh, Pa.
*General Wheelbarrow Co., Cleveland, Ohio
*Heltzel Stl. Form & Ir. Co., Warren, Ohio
*Jos. Honhorst Co., Cincinnati, Ohio
Anchor Mfg. Co., Chicago, Ill.
Beatrice Steel Tank Mfg. Co., Beatrice, Neb.
Canton Art Metal Co., Canton, Ohio
Donley Bros. Co., Cleveland, O.
Empire Metal Tank Wks., E. Rochester, N. Y.
Norris K. Davis, San Francisco, Calif.
Littleford Bros., Cincinnati

MOTORCYCLES

Cleveland Motorcycle Co., Cleveland, Ohio
Excelsior Motor Mfg. & Supply Co., Chicago
Harley-Davidson Motor Co., Milwaukee
Indian Motocycle Co., Springfield, Mass.

MOTORS, GASOLINE (See Engines, Gas and Gasoline)

MOTOR TRUCKS

*Dodge Bros., Detroit
*International Harvester Co., Chicago
*White Co., Cleveland, Ohio
Acme Motor Truck Co., Cadillac, Mich.
Amer.-La France & Foamite Corp., New York
Atterbury Motor Car Co., Buffalo, N. Y.
Autocar Co., Ardmore, Pa.
Bessemer Motor Truck Co., Grove City, Pa.
Brockway Motor Truck Co., Cortland, N. Y.
Clydesdale Motor Truck Co., Clyde, Ohio
Commerce Motor Trk. Co., Ypsilanti, Mich.
Denby Motor Truck Co., Detroit, Mich.
Diamond T. Motor Car Co., Chicago
Duplex Truck Co., Lansing, Mich.
Federal Motor Truck Co., Detroit
Ford Motor Co., Detroit
Four Wheel Drive Auto Co., Clintonville, Wis.
General Motors Truck Co., Chicago
Gramm Motors, Inc., Lima, Ohio
The Hug Co., Highland, Ill.
Indiana Truck Corp., Marion, Ind.
Kelly Springfield Truck & Bus Corp., Springfield, Ohio
Larabee-Duyo Motor Tr. Co., Binghamton, N.Y.
Luedinghaus-Espenschied Wagon Co., St. Louis
Mack Trucks, Inc., New York
Pierce-Arrow Motor Car Co., Buffalo
Reo Motor Car Co., Lansing, Mich.
Republic Truck Sales Corp., Alma, Mich.
Relay Motors Corp., Wabash, Ind.,
Standard Motor Truck Co., Detroit
Sterling Motor Truck Co., Milwaukee
Stewart Motor Corp., Buffalo, N. Y.
Toppins Trac. Truck Co., Appleton, Wis.
Traffic Motor Tr. Co., St. Louis, Mo.
United Motor Products Co., Grand Rapids, Mich.
U. S. Motor Truck Co., Cincinnati, Ohio
Luedinghaus-Espenschied Wagon Co., St. Louis
Walter Motor Truck Co., L. I. City, N. Y.
Yellow Truck & Coach Mfg. Co., Chicago

MOULDS, CONCRETE

*Blaw-Knox Co., Pittsburgh, Pa.
*Heltzel Stl. Form & Ir. Co., Warren, Ohio

MUCKING, MACHINES

Hoar Shovel Co., Duluth, Minn.

NUMBERS, HOUSE (See House Numbers)

OILS, ROAD

*Barber Asphalt Co., Philadelphia, Pa.
*Barrett Co., N. Y.
*Standard Oil Co. (Indiana), Chicago
*Standard Oil Co. (N. Y.), N. Y.
Atl. Ref. & Asph. Corp., Philadelphia, Pa.
Headley Good Roads Co., Philadelphia, Pa.
Pioneer Asph. Co., Lawrenceville, Ill.
Standard Oil Co. (La.), N. Orleans, La.
Standard Oil Co. (N. J.), Newark, N. J.
Texas Company, N. Y.

OXY-ACETYLENE APPARATUS

*Alex. Milburn Co., Baltimore, Md.
*Oxweld Acetylene Co., Long Island City, N. Y.

PACKING, WATER PIPE

The Leadite Co., Philadelphia, Pa.
United Lead Company, N. Y.

PAINTING MACHINERY

*Alex. Milburn Co., Baltimore, Md.
Binks Spray Equipment Co., Chicago
Chicago Pneumatic Tool Co., New York
De Vilbiss Mfg. Co., Toledo, Ohio
Eclipse Air Brush Co., Newark, N. J.
W. N. Matthews Corp., St. Louis
Passche Air Brush Co., Chicago
Simons Paint Spray Brush Co., Dayton, Ohio
Sprace Painting Equip. Co., Boston

PAINTS, METAL PROTECTION

*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Carey Co., Philip, Cincinnati
*Jos. Dixon Crucible Co., Jersey City, N. J.
*McEverlast, Inc., Los Angeles, Calif.
*Solvay Sales Corp., New York
Acme White Lead & Color Works, Detroit
Berry Bros., Detroit
Cook Paint & Varnish Co., Kansas City, Mo.
Detroit Graphite Co., Detroit
Detroit White Lead Works, Detroit
E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Euclid Chemical Co., Cleveland, Ohio
Hoosier Paint Works, Ft. Wayne, Ind.
Minwax Co., N. Y.
Protexol Corp., Kenilworth, N. J.
Ruberoid Co., N. Y.
Servicised Products Corp., Chicago
Sherwin-Williams Co., Cleveland, Ohio
L. Sonneborn Sons, N. Y.
Toch Brothers, N. Y.
Tropical Paint & Oil Co., Cleveland, Ohio
Truscon Laboratories, Detroit

PARK BENCHES

Logan Co., Louisville, Ky.
Fred J. Meyers Mfg. Co., Hamilton, Ohio
Millersville Supply Co., Millersville, Pa.
Stewart Iron Works Co., Cincinnati, Ohio
Van Dorn Iron Works Co., Cleveland

PAVEMENT BREAKERS (See Breakers)

PAVERS, CONCRETE

*Chain Belt Co., Milwaukee
*Jaeger Mach. Co., Columbus, Ohio
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
*Ransome Conc. Mchy. Co., Dunellen, N. J.
Foote Co., Nunda, N. Y.
T. L. Smith Co., Milwaukee

PAVING AND ROAD ROLLERS (See Road and Paving Rollers)

PAVING BLOCKS, CREOSOTED WOOD (See Creosoted Blocks)

PAVING BRICK

Alton Brick Co., Alton, Ill.
Buckeye Shale Brick Co., Cleveland, Ohio
Buffalo Brick Co., Buffalo, Kans.
Cleveland Brick & Clay Co., Cleveland, Ohio
Collinwood Shale Brick Co., Cleveland, Ohio
Corry Brick & Tile Corp., Corry, Pa.
Crescent Brick Co., Pittsburgh, Pa.
Euclid Shale Brick Co., Cleveland, Ohio
Georgia Vit. Brick Co., Augusta, Ga.
Globe Brick Co., E. Liverpool, Ohio
Hammond Fire Brick Co., Fairmount, W. Va.
Hisylvania Coal Co., Columbus, Ohio
Hocking Valley Brick Co., Columbus, Ohio
McAvoy Brick Co., Bridgeville, Pa.
Mayer Brick Co., Bridgeville, Pa.
Metropolis Paving Brick Co., Pittsburgh, Kans.
Metropolitan Paving Brick Co., Canton, Ohio
Mineral Wells Brick Co., Mineral Wells, Tex.
Moberly Paving Brick Co., Moberley, Mo.
Murphysboro Paving Brick Co., Murphysboro, Ill.
Nelson Brick Co., Nelsonville, Ohio
Nelsonville Brick Co., Columbus, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Paxton Brick Co., Watsontown, Pa.
Peebles Paving Brick Co., Portsmouth, Ohio
Peoria Brick & Tile Co., Peoria, Ill.
Purington Paving Brick Co., Galesburg, Ill.
Rose Shale Brick Co., Veedersburg, Ill.
Russell Clay Mfg. Co., Alton, Ala.
So. Clay Mfg., Chattanooga, Tenn.
Springfield Paving Brick, Springfield, Ill.
Sterling Brick Co., Olean, N. Y.
Streator Clay Mfg. Co., Streator, Ill.
Terra Haute Vit. Brick Co., Terre Haute, Ind.
Thornton Fire Brick Co., Clarksburg, W. Va.
Thurber Brick Co., Thurber, Tex.
Toronto Fire Clay Co., Toronto, Ohio
Trinidad Brick & Tile Co., Trinidad, Colo
United Clay Products Corp., Kansas City
Western Shale Products Co., Ft. Scott, Kans.
Westport Paving Brick Co., Westport, Md.

PAVING MACHINERY (See Road and Paving Machinery)

PAVING GUARDS, STEEL

W. S. Godwin Co., Baltimore, Md.

PAVING MATERIALS (See "Asphalt," "Paving Brick," "Granite Block," etc.)

PAVING MIXERS (See Concrete Mixers)

PAVING TOOLS

*Barber Asphalt Co., Philadelphia, Pa.
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Jos Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Inc., Hoboken, N. J.
*Warren Bros. Co., Boston
Asroil Burner Co., West New York, N. J.
W. H. Anderson Tool & Supply Co., Detroit
F. D. Cummer & Sons Co., Cleveland, Ohio
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Bros. Co., Cincinnati, Ohio

PICKS

Hubbard Co., Pittsburgh, Pa.
Iron City Tool Works, Pittsburgh
Klein-Logan Co., Pittsburgh
Oliver Iron & Steel Corp., Pittsburgh, Pa.
Verona Tool Works, Verona, Pa.
Warren Tool & Forge Co., Warren, Ohio
Warwood Tool Co., Wheeling, W. Va.
Wyoming Shovel Works, Wyoming, Pa.

PILE DRIVERS

*Brown Clutch Co., Sandusky, Ohio
*Bucyrus-Erie Co., Erie, Pa.
*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*Lidgerwood Mfg. Co., Elizabeth, N. J.
*McKiernan-Terry Drill Co., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., East Boston

PILE-HAMMERS, STEAM

*Clyde Iron Works Sales Co., Duluth, Minn.
*Industrial Brownhoist Corp., Cleveland
*McKiernan-Terry Drill Co., N. Y.
*Union Iron Works, Inc., Hoboken, N. J.
*Wemlinger, Inc., N. Y.
National Hoisting Engine Co., Harrison, N. J.
Vulcan Iron Works, Chicago

PILING, CONCRETE

MacArthur Conc. Pile & F'd'n Co., N. Y.
Raymond Concrete Pile Co., N. Y.

PILING, INTERLOCKING STEEL

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh

PILING, STEEL SHEET

*Wemlinger, Inc., New York
Bethlehem Steel Co., Bethlehem, Pa.

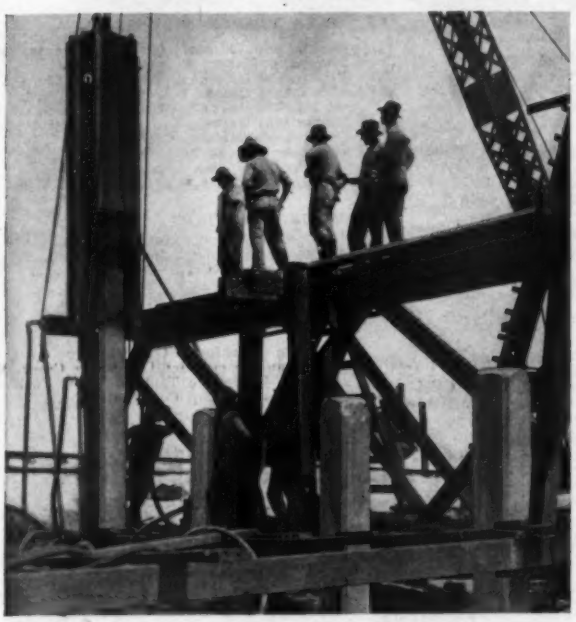
PIPE, CAST IRON

*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
Am. Cast Iron Pipe Co., Birmingham, Ala.
J. B. Clow & Sons, Chicago
Donaldson Iron Co., Emaus, Pa.
John Fox & Co., N. Y.
Glamorgan Pipe & F'dry Co., Lynchburg, Va.
Lynchburg F'dry Co., Lynchburg, Va.
McWane Cast Iron Pipe Co., Birmingham, Ala.
National Cast Iron Pipe Co., Birmingham, Ala.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE, CULVERT (See Culverts)

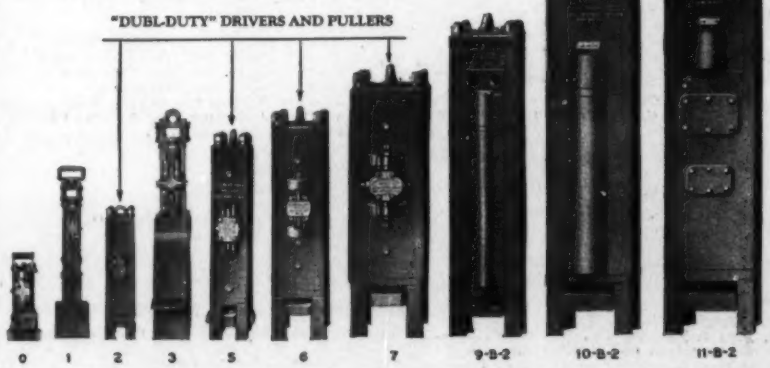
If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

DRIVING BIG CONCRETE PILES



Driving 16-inch concrete bearing piles, 16 inches square, with a McKiernan-Terry No. 11-B-2 Pile Hammer. There were 1700 of these piles, from 20 to 60 feet long, driven into sand and disintegrated limestone rock. On the same job there were 700 precast concrete sheet piles, averaging 25 feet long, driven with a No. 7 McKiernan-Terry Pile Hammer. (The No. 11-B-2 weighs 13,185 pounds; No. 7, 5,075 pounds) . . . . These are among a hundred interesting job pictures in McKiernan-Terry Bulletin 37, which will be sent to you on request. Please address McKIERNAN-TERRY DRILL CO. 19 Park Row, New York.

McKiernan-Terry
Double-Acting Pile Hammers



McKiernan-Terry
PILE HAMMERS

Where to Purchase

PIPE, LEAD
United Lead Company, N. Y.

PIPE, REINFORCED CONCRETE
*Newark Concrete Pipe Co., Newark, N. J.
Concrete Products Co., Pittsburgh, Pa.
Core Joint Concrete Pipe Co., Baltimore
Independent Concrete Pipe Co., Indianapolis
Lock Joint Pipe Co., Ampere, N. J.

PIPE, RIVETED STEEL OR IRON
*Connery & Co., Inc., Philadelphia, Pa.
*Jos. Honhorst Co., Cincinnati, O.
Abendroth & Root Mfg. Co., Newburgh, N. Y.
American Spiral Pipe Works, Chicago
Biggs Boiler Works, Akron
Canton Culvert & Silo Co., Canton, O.
Chattanooga Boiler & Tank Co., Chatta., Tenn.
Chicago Bridge & Iron Works, Chicago
East Jersey Pipe Co., N. Y.
Hammond Iron Works, Warren, Pa.
R. Hardesty Mfg. Co., Denver
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, O.
Pittsburgh-Des Moines Steel Co., Pittsb'h, Pa.
Tippett & Wood, Phillipsburg, N. J.
Weller Mfg. Co., Chicago

PIPE, STEEL
Central Tube Co., Pittsburgh, Pa.
Jones & Laughlin Steel Co., Pittsburgh
National Tube Co., Pittsburgh
Republic Iron & Steel Co., Youngstown, O.
South Chester Tube Co., Chester, Pa.
Spang-Chalfont & Co., Pittsburgh, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE, WOOD
American Wood Pipe Co., Tacoma, Wash.
Federal Tank & Pipe Co., Seattle, Wash.
Michigan Pipe Co., Bay City, Mich.
Pacific Pipe & Tank Co., San Francisco
Redwood Mfrs. Co., San Francisco
Standard Wood Pipe Co., Williamsport, Pa.
A. Wyckoff & Sons Co., Elmira, N. Y.

PIPE, WROUGHT IRON
A. M. Byers Co., Pittsburgh, Pa.
Cohoes Rolling Mill Co., Cohoes, N. Y.
Reading Iron Co., Reading, Pa.

PIPE BENDING MACHINES
American Pipe Bending Mach. Co., Boston
Watson-Stillman Co., New York

PIPE COVERING

AIRCELL
*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
National Asbestos Co., Jersey City, N. J.
Norristown Mag. & Asb. Co., Norristown, Pa.
Sall Mountain Co., Chicago
H. F. Watson Co., Erie, Pa.

85 PER CENT MAGNESIA
*Philip Carey Co., Cincinnati, Ohio
Ehret Mag. Mfg. Co., Valley Forge, Pa.
Johns-Manville, Inc., N. Y.
Keasbey & Mattison Co., Ambler, Pa.
Norristown Mag. & Asb. Co., Norristown, Pa.

WOOD
Redwood Mfrs. Co., San Francisco
A. Wyckoff & Son Co., Elmira, N. Y.

PIPE CUTTERS (See Cutters, Pipe, Head)

PIPE FITTINGS
*Central Foundry Co., N. Y.
*U. S. Pipe & Foundry Co., Burlington, N. J.
American Cast Iron Co., Birmingham, Ala.
Builders Iron Foundry, Providence, R. I.
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Donaldson Iron Co., Emaus, Pa.
Lunkenheimer Co., Cincinnati, O.
Ntl. C. I. Pipe Co., Birmingham, Ala.
Reading Steel Casting Co., Inc., Bridgeport, Conn.
Warren Foundry & Pipe Co., N. Y.
R. D. Wood & Co., Philadelphia, Pa.

PIPE HANDLING MACHINERY
Taylor Portable Steel Derrick Co., Chicago

PIPE TAPPING MACHINERY (See Water Main Tapping)

PIPE JOINT COMPOUND (Sewer)
*Philip Carey Co., Cincinnati, Ohio
*Jos. Dixon Crucible Co., Jersey City, N. J.
Atlas Mineral Prod. Co., Mertztown, Pa.
The Leadite Co., Philadelphia, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Texas Co., New York
Waring-Underwood Co., Philadelphia, Pa.

PIPE JOINT MATERIAL (Cast Iron)
Hydraulic Development Co., Boston
The Leadite Co., Philadelphia, Pa.
United Lead Co., New York

PIPE PUSHERS
*Templeton, Kenly & Co., Chicago
Duff Mfg. Co., Pittsburgh
Easy Mfg. Co., Lincoln, Neb.
Giant Mfg. Co., Council Bluffs, Ia.

PIPE THREADERS
Armstrong Mfg. Co., Bridgeport, Conn.

PLANERS, PNEUMATIC
Tousley Tool Co., Cleveland, Ohio

PLAYGROUND APPARATUS
American Playground Device Co., Anderson, Ind.
Chicago Gymnasium Equipment Co., Chicago
Everwear Mfg. Co., Springfield, O.
Giant Mfg. Co., Council Bluffs, Ia.
Hill-Standard Co., Anderson, Ind.
R. F. Lamar & Co., Pueblo, Colo.
Fred. Medart Mfg. Co., St. Louis, Mo.
Mitchell Mfg. Co., Milwaukee
Patterson-Williams Co., San Jose, Calif.
A. G. Spalding & Bros., Chicopee, Mass.

PLOWS, CONTRACTORS'
*Austin-Western Road Mach. Co., Chicago
*Caterpillar Trac. Co., San Leandro, Cal.
*General Wheelbarrow Co., Cleveland
*International Harvester Co., Chicago
*Roderick Lean Mfg. Co., Mansfield, O.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, O.
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Moline Implement Co., Moline, Ill.
Oliver Chilled Plow Works, South Bend, Ind.
Sidney Steel Scraper Co., Sidney, O.
Slusser-McLean Scraper Co., Sidney, O.
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLOWS, ROAD AND ROOTER
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
*General Wheelbarrow Co., Cleveland
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
Ted Carr & Co., Chicago
Deere & Co., Moline, Ill.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
P. B. Hackley Equip. Co., San Francisco
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Western Wheeled Scraper Co., Aurora, Ill.
Wiard Plow Co., Batavia, N. Y.

PLUMBING SUPPLIES
J. B. Clow & Sons, Chicago
Crane Co., Chicago
Glauber Brass Mfg. Co., Cleveland, O.
J. L. Mott Iron Works, N. Y.
Mueller Company, Decatur, Ill.
Rundle-Spence Mfg. Co., Milwaukee
Walworth Mfg. Co., Boston

PNEUMATIC CONCRETE PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PNEUMATIC GROUT MIXERS & PLACERS
*Ransome Concrete Machinery Co., Dunellen, N. J.
Cement-Gun Co., Inc., Allentown, Pa.

PORTABLE BUILDINGS
*Blaw-Knox Co., Pittsburgh, Pa.
*Truscon Steel Co., Youngstown, O.
Littleford Bros., Cincinnati, O.

PORTABLE STEEL DERRICKS (See Derricks, Steel Portable)

PORTABLE WOOD WORKERS
*American Saw Mill Machinery Co., Hackettstown, N. J.
Jaeger Portable Power Corp., Detroit
Jones Superior Machine Co., Chicago

PORTLAND CEMENT (See Cement)

POTS, ASPHALT AND TAR, POURING
*Barber Asphalt Co., Philadelphia, Pa.
Acme Road Machinery Co., Frankfort, N. Y.
Beach Manufacturing Co., Charlotte, Mich.
Littleford Bros., Cincinnati, Ohio

POWDER (See Explosives)

POWER PLANTS, INDUSTRIAL
*Continental Motors Corp., Muskegon, Mich.
*Hercules Motors Corp., Canton, O.
*Sanderson-Cyclone Drill Co., Orrville, O.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Engine Co., Hillsdale, Mich.
Buda Co., Harvey, Ill.
Climax Engine Co., Clinton, Iowa
Hinkley Motors, Inc., Detroit
Servel Mfg. Co., Evansville, Ind
Wisconsin Motor Co., Milwaukee, Wis.

PULLING MACHINES
*Beebe Bros., Inc., Seattle, Wash.
*Clyde Iron Works Sales Co., Duluth, Minn.
John Waldron Corp., New Brunswick, N. J.

PUMPS, AIR LIFT
*Sullivan Machinery Co., Chicago
American Steam Pump Co., Battle Creek, Mich.
Chicago Pneumatic Tool Co., New York
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York

PUMPS, CENTRIFUGAL
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Chain Belt Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Homelite Corp., Port Chester, N. Y.
*La Bour Co., Chicago Heights, Ill.
*Novo Engine Co., Lansing, Mich.
Aldrich Pump Co., Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Steam Pump Co., Buffalo, N. Y.
A. S. Cameron Steam Pump Works, New York.
Chicago Pump Co., Chicago
Cook Motor Co., Delaware, O.
Dayton-Dowd Co., Quincy, Ill.
Dean Bros. Co., Indianapolis
De Laval Steam Turbine Co., Trenton, N. J.
Erie Pump & Engine Works, Medina, N. Y.
Evinrude Motor Co., Milwaukee
Fairbanks, Morse & Co., Chicago
General Electric Co., Schenectady
Goulds Pumps, Inc., Seneca Falls, N. Y.
Humphryes Mfg. Co., Mansfield, Ohio
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Keystone Driller Co., Beaver Falls, Pa.
LeCourtenay Co., Newark, N. J.
Manistee Iron Works, Manistee, Mich.
Morris Machine Works, Baldwinsville, N. Y.
Rumsey Pump Co., Seneca Falls, N. Y.
Trench & Marine Pump Co., New York
United Iron Works, Inc., Kansas City, Mo.
Warren Steam Pump Co., Warren, Mass.
Weinman Pump Mfg. Co., Columbus, O.
Wheeler Condenser & Eng. Co., Carteret, N. J.
Worthington Pump & Machinery Corp., N. Y.
Yeomans Bros. Co., Chicago

PUMPS, CONTRACTORS'
*Ralph E. Carter Co., New York
*C. H. & E. Mfg. Co., Milwaukee
*Chain Belt Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Homelite Corp., Port Chester, N. Y.
*La Bour Co., Chicago Heights, Ill.
*John Lauson Mfg. Co., New Holstein, Wis.
*Novo Engine Co., Lansing, Mich.
*Waukesha Motor Co., Waukesha, Wis.
Aldrich Pump Co., Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, Ohio
Buda Co., Harvey, Ill.
A. S. Cameron Steam Pump Works, New York
Construction Machinery Co., Waterloo, Iowa
Dayton-Dowd Co., Quincy, Ill.
Deming Co., Salem, O.
Emerson Pump & Valve Co., Alexandria, Va.
Erie Pump & Engine Works, Medina, N. Y.
Fairbanks, Morse & Co., Chicago
Goulds Pumps, Inc., Seneca Falls, New York
Humphryes Mfg. Co., Mansfield, Ohio
Ingersoll-Rand Co., New York
Jaeger Portable Power Corp., Detroit

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For Every Power Need in Highway and General Industrial Service

WHERE hard work and heavy going are part of the daily program *put a Cletrac on the job!* Bigger loads are hauled — faster travel is attained—the difficulties of bad weather are overcome — and a definite saving of time, labor and money is made.

Large fleets of Cletracs are in use by nearly all State Highway Departments. In fleets and singly they are an important part of the equipment of hundreds of road contractors, general contractors and construction companies. Wherever real capacity and thorough dependability are demanded, there you will find CLETRACS the preferred tractors.

Cletracs are built in a complete line — a range of tractor sizes from 20 h. p. to 100 h. p. to cover every possible power need. Mail the coupon — or write for catalog and full particulars.

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THE CLEVELAND TRACTOR CO.
19321 Euclid Ave., Cleveland, Ohio.

Send full details of Cletrac for industrial work.

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Address _____

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Where to Purchase

PUMPS, CONTRACTORS, (Continued)
Kinney Mfg. Co., Boston
LeCourtenay Co., Newark, N. J.
Morris Machine Works, Baldwinsville, N. Y.
F. E. Myers & Bros. Co., Ashland, O.
Pulsometer Steam Pump Co., New York
Rumsey Pump Co., Seneca Falls, N. Y.
Standard Scale & Supply Corp., Pittsburgh
Trench & Marine Pump Co., New York
Van Nouhuys Machine Works, Albany, N. Y.
Waldo Bros. & Bond Co., Boston, Mass.

PUMPS, DEEP WELL
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Novo Engine Co., Lansing, Mich.
Aldrich Pump Co., Allentown, Pa.
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
A. S. Cameron Steam Pump Works, New York
A. D. Cook, Inc., Lawrenceburg, Ind.
Dean Bros. Co., Indianapolis
Deming Co., Salem, O.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Harris Air Pump Co., Indianapolis
Humphryes Mfg. Co., Mansfield, Ohio
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Keystone Driller Co., Beaver Falls, Pa.
Layne & Bowler, Inc., Memphis, Tenn.
A. Y. McDonald Mfg. Co., Dubuque, Iowa
Midwest Engineering Co., Indianapolis, Ind.
F. E. Myers & Bros. Co., Ashland, O.
Rumsey Pump Co., Seneca Falls, N. Y.
Trench & Marine Pump Co., New York
United Iron Works, Inc., Kansas City, Mo.
Weinman Pump Mfg. Co., Columbus, O.

PUMPS, DIAPHRAGM
*C. H. & E. Mfg. Co., Milwaukee
*Ralph B. Carter Co., New York
*Chain Belt Co., Milwaukee, Wis.
*Construction Machinery Co., Waterloo, Ia.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Novo Engine Co., Lansing, Mich.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Deming Co., Salem, Ohio
Dorr Co., New York
Goulds Pumps, Inc., Seneca Falls, N. Y.
Humphryes Mfg. Co., Mansfield, Ohio
Trench & Marine Pump Co., New York
Waldo Bros. & Bond Co., Boston, Mass.
Witte Engine Works, Kansas City, Mo.

PUMPS, DREDGING
Ellicott Machinery Corp., Baltimore, Md.
Erie Pump & Engine Wks., Medina, N. Y.
Morris Machine Works, Baldwinsville, N. Y.
Trench & Marine Pump Co., New York

PUMPS, GASOLINE AND OIL
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Ingersoll-Rand Co., New York
Kinney Mfg. Co., Boston
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Wayne Tank & Pump Co., Ft. Wayne, Ind.

PUMPS, PORTABLE
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Homelite Corp., Port Chester, N. Y.
*John Lauson Mfg. Co., New Holstein, Wis.
American Steam Pump Co., Battle Creek, Mich.
Evinrude Motor Co., Milwaukee
Humphryes Mfg. Co., Mansfield, Ohio
Jaeger Portable Power Corp., Detroit
Trench & Marine Pump Co., New York

PUMPS, POWER
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*Domestic Eng. & Pump Co., Shippensburg, Pa.
*Homelite Corp., Port Chester, N. Y.
*Novo Engine Co., Lansing, Mich.
*Waukesha Motor Co., Waukesha, Wis.
Alamo Iron Works, San Antonio, Texas
Aldrich Pump Co., Allentown, Pa.
Allis-Chalmers Mfg. Co., Milwaukee
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Aurora Pump & Mfg. Co., Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
Chicago Pump Co., Chicago
Dayton, Dowd Co., Quincy, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Deming Co., Salem, O.
Evinrude Motor Co., Milwaukee
Fairbanks, Morse & Co., Chicago
Gardner-Denver Co., Quincy, Ill.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Humphryes Mfg. Co., Mansfield, Ohio
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Kinney Mfg. Co., Boston
Lawrence Machinery Co., Lawrence, Mass.
LeCourtenay Co., Newark, N. J.
F. E. Myers & Bro. Co., Ashland, O.
Northern Fire Apparatus Co., Minneapolis
Rumsey Pump Co., Seneca Falls, N. Y.
Trench & Marine Pump Co., New York
Weinman Pump Mfg. Co., Columbus, O.
Worthington Pump & Machinery Corp., N. Y.
Yeomans Bros. Co., Chicago

PUMPS, SEWAGE
*C. H. & E. Mfg. Co., Milwaukee, Wis.
*La Bour Co., Chicago Heights, Ill.
American Steam Pump Co., Battle Creek, Mich.
American Well Works, Aurora, Ill.
Barnes Mfg. Co., Mansfield, O.
A. S. Cameron Steam Pump Works, New York
Chicago Pump Co., Chicago
Fairbanks, Morse & Co., Chicago
Humphreyes Mfg. Co., Mansfield, Ohio
Ingersoll-Rand Co., New York
Pacific Flush Tank Co., Chicago and N. Y.
Warren Steam Pump Co., Warren, Mass.
Yeomans Bros. Co., Chicago

PUMPS, TAR AND ASPHALT
*Barber Asphalt Co., Philadelphia
Kinney Mfg. Co., Boston

PUNCHES AND DIES, STEEL
*Cleveland Steel Tool Co., Cleveland, O.

RADIATORS FOR GASOLINE ENGINES
McCord Radiator Mfg. Co., Detroit
Modine Mfg. Co., Racine, Wis.
Racine Radiator Co., Racine, Wis.
Young Radiator Co., Racine, Wis.

RAIL AND RAIL JOINTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie Steel Co., Pittsburgh, Pa.
Easton Car & Construction Co., Easton, Pa.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.
W. A. Zelnicker Supply Co., St. Louis, Mo.

RAILROAD DITCHERS (See Excavators, Ditch and Trench)

REINFORCING CONCRETE (See Concrete Reinforcement)

RIVETERS, PNEUMATIC
*The Buhl Company, Chicago
*Independent Pneu. Tool Co., Chicago
Alliance Machine Co., Alliance, O.
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland, O.
Hanna Engineering Works, Chicago
Helwig Mfg. Co., St. Paul, Minn.
Ingersoll-Rand Co., New York
Wm. H. Keller, Inc., Grand Haven, Mich.
Southwark Foundry & Machine Co., Phila.
Watson-Stillman Co., New York

RIVET SETS
*Cleveland Steel Tool Co., Cleveland, O.
*Independent Pneu. Tool Co., Chicago
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland, O.
Dunbar Drop Forge Co., Chicago
Ingersoll-Rand Co., New York

ROAD GRADERS, HORSE OR TRACTOR DRAWN
*Austin-Western Road Mchy. Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Cal.
*Good Roads Machinery Co., Kennett Sq., Pa.
*Killefer Mfg. Co., Los Angeles
*W. A. Riddell Co., Bucyrus, O.
*Gustav Schaefer Co., Cleveland
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
Austin Mfg. Co., Chicago
Banting Mfg. Co., Toledo, O.
Beach Mfg. Co., Charlotte, Mich.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
Klauer Mfg. Co., Dubuque, Iowa
Little Red Wagon Mfg. Co., Omaha
Lyle Culvert & Road Equipment Co., Minneapolis
N. S. Monroe & Sons, Arthur, Ill.
New England Road Machy. Co., So. Boston, Mass.
Owensboro Ditcher & Grader Co., Owensboro, Ky.
Rome Mfg. Co., Rome, N. Y.
Ryan Mfg. Co., Chicago.
Spears-Wells Machinery Co., Oakland, Cal.
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

ROAD GRADERS, POWER
*Austin-Western Road Machy. Co., Chicago
*Caterpillar Tractor Co., San Leandro, Cal.
*Good Roads Machinery Co., Kennett Sq., Pa.
*W. A. Riddell Co., Bucyrus, O.
Acme Road Machinery Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis
Beach Mfg. Co., Charlotte, Mich.
Galion Iron Works & Mfg. Co., Galion, O.
Gilbert Mfg. Co., Aberdeen, S. D.
Landreth Machinery Co., Joplin, Mo.
Little Red Wagon Mfg. Co., Omaha
Rome Mfg. Co., Rome, N. Y.
Spears-Wells Machinery Co., Oakland, Cal.
Wehr Co., Milwaukee

ROAD MAINTAINERS, POWER
*Caterpillar Tractor Co., San Leandro, Cal.
*Good Roads Machinery Co., Kennett Sq., Pa.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
Landreth Machinery Co., Joplin, Mo.
Rome Mfg. Co., Rome, N. Y.
Spears-Wells Machinery Co., Oakland, Cal.
Stockland Road Machinery Co., Minneapolis

ROAD OILS (See Oils, Road)

ROAD OILERS
*Austin-Western Road Machy. Co., Chicago
*Good Roads Mchy. Co., Kennett Sq., Pa.
E. D. Etnyre & Co., Oregon, Ill.
Kinney Mfg. Co., Boston
Mack Trucks, Inc., New York
Municipal Supply Co., South Bend, Ind.
Spears-Wells Machinery Co., Oakland, Cal.
White Co., Cleveland

ROCK CRUSHERS AND PULVERIZERS (See Crushers)

ROCK DRILLS (See Drills, Rock)

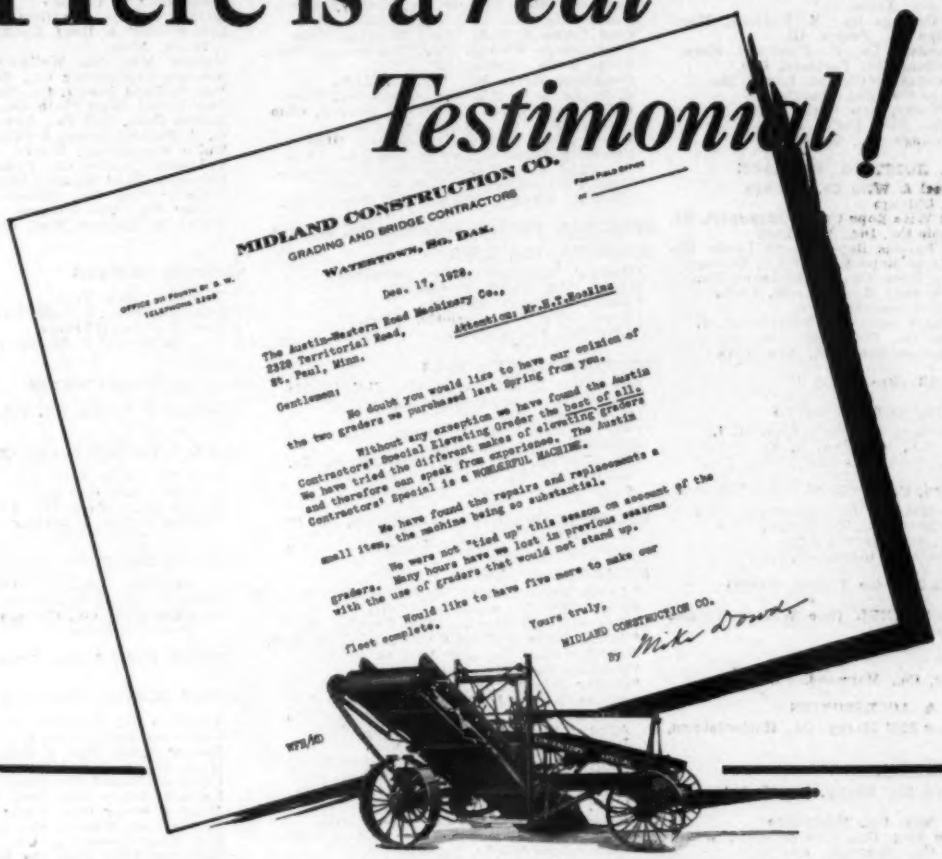
ROLLERS, EMBANKMENT
Acme Road Machy. Co., Frankfort, N. Y.
Beach Mfg. Co., Charlotte, Mich.
H. W. Rohl & Co., Los Angeles, Calif.

ROLLERS, ROAD AND PAVING
*Austin-Western Road Mchy. Co., Chicago
*Barber Asphalt Co., Philadelphia
*Buffalo-Springfield Roller Co., Springfield, O.
*Good Roads Machinery Co., Kennett Sq., Pa.
*Huber Mfg. Co., Marion, Ohio
*W. A. Riddell Co., Bucyrus, Ohio
Acme Road Machinery Co., Frankfort, N. Y.
Ames Iron Works, Oswego, N. Y.
Austin Mfg. Co., Chicago
Banting Mfg. Co., Toledo, O.
Beach Mfg. Co., Charlotte, Mich.
J. I. Case Threshing Mach. Co., Racine, Wis.
Erie Machine Shops, Erie, Pa.
Galion Iron Works & Mfg. Co., Galion, O.
Horst & Strieter Co., Davenport, Iowa
Kinney Standards, Inc., Brooklyn, N. Y.
Wehr Co., Milwaukee

ROOFING, ASBESTOS, ASPHALT, COMPOSITION, TILE, ETC.
*Barber Asphalt Co., Philadelphia
*Barrett Co., New York
*Philip Carey Co., Cincinnati, O.
*Standard Oil Co. (Indiana), Chicago
American Cement Tile Mfg. Co., Pittsburgh
Atlantic Refining & Asphalt Corp., Phila., Pa.
Beaver Products Co., Inc., Buffalo, N. Y.
Bird & Son, Inc., East Walpole, Mass.
Certain-teed Products Corp., New York
Chatfield Mfg. Co., Cincinnati, O.
Decatur Roofing & Cornice Co., Albany, Ala.
Edwards Mfg. Co., Cincinnati, O.
Euclid Chemical Co., Cleveland
Flintkote Co., Boston
Johns-Manville, Inc., New York
Keystone Roofing Mfg. Co., York, Pa.
The Lehon Co., Chicago
F. J. Lewis Mfg. Co., Chicago
National Roofing Co., Tonawanda, N. Y.
National Sheet Metal Roofing Co., Jersey City, N. J.
W. F. Norman Sheet Metal Mfg. Co., Nevada, Mo.
Ruberoid Co., New York
Sall Mountain Co., Chicago
Sifo Products Co., St. Paul, Minn.
L. Sonneborn & Sons, Inc., New York
Texas Co., New York
Western Elaterite Roofing Co., Denver

ROOFING KETTLES (See Kettles)

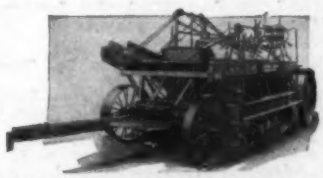
Here is a *real Testimonial!*


MIDLAND CONSTRUCTION CO.
GRADING AND BRIDGE CONTRACTORS
WATERTOWN, So. Dak.
Dec. 17, 1928.
The Austin-Western Road Machinery Co.,
2328 Territorial Road,
St. Paul, Minn.
Attention: Mr.J.T.Rosling
Gentlemen:
No doubt you would like to have our opinion of the two graders we purchased last Spring from you.
Without any exception we have found the Austin Contractors' Special Elevating Grader the best of all. We have tried the different makes of elevating graders and therefore can speak from experience. The Austin Contractors' Special is a WONDERFUL MACHINE.
We have found the repairs and replacements a small item, the machine being so substantial.
We were not "tied up" this season on account of the graders. Many hours have we lost in previous seasons with the use of graders that would not stand up.
Would like to have five more to make our fleet complete.
Yours truly,
MIDLAND CONSTRUCTION CO.
By Mike Dowd
WTS/MD

HERE is a real testimonial on Austin-Western Elevating Graders—unsolicited—and backed by an order, just received, for *five more machines.* It is eloquent of one of the main advantages of Austin-Western Elevating Graders—their ability to stand up under the most difficult conditions of service and do their work.

The arched frame and the many typical Austin details of design that give smooth operation, together with the generous factor of safety allowed on all parts, tell their own story in Mr. Dowd's letter.

Another outstanding feature on the Contractor's Special is the Power Take-Off. This provides power direct from the tractor motor for operating the elevator. It increases the capacity of the grader and permits working it under conditions heretofore impossible for an elevating grader.

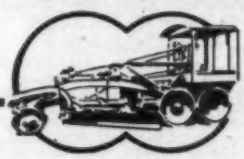


THE WESTERN LEVEE SPECIAL ELEVATING GRADER with engine-driven belt has a greatly increased capacity. Other feature are: a new elevator, tongue and redesigned frame.

Write us today for the Elevating Grader Catalog showing the many reasons why these machines have made elevating grader history.

Austin-Western Road Machinery Co., 400 North Michigan Avenue, Chicago, Illinois, Branches in principal cities.

Austin-Western
ROAD MACHINERY

THE NEW  DUAL DRIVE

Where to Purchase

ROPE, MANILA
American Mfg. Co., Brooklyn, N. Y.
Columbian Rope Co., Auburn, N. Y.
Cupples Cordage Co., Brooklyn, N. Y.
Hooven & Allison Co., Xenia, O.
R. A. Kelly Co., Xenia, O.
N. Bedford Cordage Co., N. Bedford, Mass.
Peoria Cordage Co., Peoria, Ill.
Plymouth Cordage Co., N. Plymouth, Mass.
Portland Cordage Co., Portland, Ore.
St. Louis Cordage Mills, St. Louis, Mo.
Tubbs Cordage Co., San Francisco
Wall Rope Works, New York
Waterbury Co., New York
Whitlock Cordage Co., New York

ROPE, WIRE, HOISTING, HAULAGE
*American Steel & Wire Co., Chicago
*L. P. Green, Chicago
*Williamsport Wire Rope Co., Williamsport, Pa.
American Cable Co., Inc., New York
Broderick & Bascom Rope Co., St. Louis, Mo.
Fischer & Hayes Rope & Steel Co., Chicago
Hazard Wire Rope Co., Wilkesbarre, Pa.
A. Leschen & Sons Rope Co., St. Louis
Macwhyte Co., Kenosha, Wis.
J. A. Roebling's Sons Co., Trenton, N. J.
Upson-Walton Co., Cleveland, Ohio
Wickwire Spencer Steel Co., New York

RUBBER TIRES (See Tires)

SALAMANDERS, OIL BURNING
*Aeroil Burner Co., West New York, N. J.
Hauck Mfg. Co., Brooklyn, N. Y.
Littleford Brothers, Cincinnati, Ohio

SALAMANDERS, COKE OR WOOD BURNING
*General Wheelbarrow Co., Cleveland, Ohio
*Joseph Hornherst Co., Cincinnati, Ohio
Jackson Mfg. Co., Harrisburg
Littleford Brothers, Cincinnati, Ohio

SAFETY TREADS (See Treads, Safety)

SASH ROLLER STEEL (See Window Frames and Sash)

SAW HORSES
Everhot Mfg. Co., Maywood, Ill.

SAW MILLS & ACCESSORIES
*American Saw Mill Machy. Co., Hackettstown, N. J.

SAW RIGS, PORTABLE
*American Saw Mill Machy. Co., Hackettstown, N. J.
*C. H. & E. Mfg. Co., Milwaukee
*John Lauson Mfg. Co., New Holstein, Wis.
Beach Mfg. Co., Montrose, Pa.
De Walt Products Co., Leola, Pa.
Jones Superior Machine Co., Chicago
Knickerbocker Co., Jackson, Mich.
Leach Co., Oshkosh, Wis.
Witte Engine Works, Kansas City, Mo.

SAWS, PORTABLE POWER
*Tensley Tool Co., Cleveland, Ohio ....
Electric-Magneto Tool Co., Chicago
Flexway Corp., Cincinnati, Ohio
Ingersoll-Rand Co., New York
Michel Electric Hand Saw Co., Chicago
Porter Cable Machinery Co., Syracuse
Reed-Prentice Corp., Worcester, Mass.
F. L. Rogers & Co., Chicago
Skilsaw, Inc., Chicago, Ill.
Wappat Gear Works, Pittsburgh, Pa.
Witte Engine Works, Kansas City, Mo.

SCARIFIERS
*Austin-Western Road Machy. Co., Chicago
*Barber Asphalt Co., Philadelphia
*Buffalo-Springfield Roller Co., Springfield, O.
*Caterpillar Tractor Co., San Leandro, Cal.
*Good Roads Machy. Co., Kennett Sq., Pa.
*Huber Mfg. Co., Marion, Ohio
Acme Road Machinery Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Banting Mfg. Co., Toledo, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
Klauer Mfg. Co., Dubuque, Iowa
Rome Mfg. Co., Rome, N. Y.
Universal Road Machy. Co., Kingston, N. Y.

SCARIFIERS, TEETH FOR
*Caterpillar Tractor Co., San Leandro, Cal.
Galion Iron Works & Mfg. Co., Galion, Ohio
Shunk Mfg. Co., Bucyrus, Ohio

SCOOPS, HORSE OR TRACTOR DRAWN (See Scrapers Drag, Scrapers, Rotary and Scrapers, Wheeled)

SCOOPS, HAND (See Shovels, Spades and Scoops)

SCOOPS, SKIMMER AND TRENCH
*Bay City Shovels, Inc., Bay City, Mich.
Keystone Driller Co., Beaver Falls, Pa.

SCRAPERS, DRAG
*Austin-Western Road Machinery Co., Chicago
*Caterpillar Tractor Co., San Leandro, Calif.
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
Chattanooga Whlbrw Co., Chattanooga, Tenn.
Deere & Co., Moline, Ill.
Donaldson Bros., Mt. Clemens, Mich.
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
Jackson Mfg. Co., Harrisburg, Pa.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Stockland Road Machinery Co., Minneapolis
Toledo Wheelbarrow Co., Toledo, Ohio
Western Wheeled Scraper Co., Aurora, Ill.

SCRAPERS, FRESNO (See Scrapers, Rotary)

SCRAPERS, DRAGLINE
*General Wheelbarrow Co., Cleveland
*Garst Mfg. Company, Chicago
*Sauerman Bros., Chicago
Beach Mfg. Co., Carlotte, Mich.
Link-Belt Co., Chicago

SCRAPERS, POWER DRAG
*Beaumont Manufacturing Co., Philadelphia
*Garst Mfg. Company, Chicago
*L. P. Green, Chicago
*W. A. Riddell Co., Bucyrus, Ohio
*Sauerman Bros., Chicago
*Schofield-Burkett Constr. Co., Macon, Ga.
Beach Mfg. Co., Charlotte, Mich.
General Wheelbarrow Co., Cleveland

SCRAPERS, ROAD (See also Drags, Road)
Rome Mfg. Co., Rome, N. Y.
Root Spring Scraper Co., Kalamazoo, Mich.

SCRAPERS, ROTARY
*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*Killefer Mfg. Co., Los Angeles, Calif.
*Roderick Lean Co., Mansfield, Ohio
*Gustav Schaefer Co., Cleveland, Ohio
Adams & Co., J. D., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, O.
H. C. Shaw Co., Stockton, Calif.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
Solano Iron Works, Berkeley, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
General Wheelbarrow Co., Cleveland, Ohio
Lyle Culvert & Road Equip. Co., Minneapolis
Miskin Scraper Works, Ucon, Idaho
Root Spring Scraper Co., Kalamazoo
Sidney Steel Scraper Co., Sidney, O.
Stockland Road Machinery Co., Minneapolis
Western Wheeled Scraper Co., Aurora, Ill.

SCRAPERS, SELF-LOADING (See Scrapers, Rotary and Scrapers, Wheeled)

SCRAPERS, WHEELED
*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Caterpillar Tractor Co., San Leandro, Calif.
*Euclid Crane & Hoist Co., Euclid Village, O.
*General Wheelbarrow Co., Cleveland
*W. A. Riddell Co., Bucyrus, Ohio
Acme Road Machy. Co., Frankfort, N. Y.
J. D. Adams & Co., Indianapolis, Ind.
American Steel Scraper Co., Sidney, Ohio
Atlas Scraper Co., Los Angeles, Calif.
Beach Mfg. Co., Charlotte, Mich.
Case Crane & Engg. Co., Columbus, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Galion Iron Works & Mfg. Co., Galion, Ohio
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Miami Trailer Scraper Co., Troy, Ohio
Miskin Scraper Wks., Ucon, Ia.
Sidney Steel Scraper Co., Sidney, Ohio
Slusser-McLean Scraper Co., Sidney, Ohio
H. C. Shaw Co., Stockton, Calif.
Stockland Road Machy. Co., Minneapolis, Minn.
Western Wheeler Scraper Co., Aurora, Ill.

SCREENS, SAND, GRAVEL AND COAL
*Austin-Western Road Machinery Co., Chicago
*Chain Belt Co., Milwaukee, Wis.
*Chicago Automatic Conv. Co., Chicago
*Good Roads Machinery Co., Kennett Sq., Pa.
*L. P. Green, Chicago
*Geo. Haiss Mfg. Co., New York
Acme Road Machinery Co., Frankfort, N. Y.
Allis-Chalmers Mfg. Co., Milwaukee
Atlas Engineering Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
C. O. Bartlett & Snow Co., Cleveland, Ohio
Beach Mfg. Co., Charlotte, Mich.
Brown Hoisting Machy. Co., Cleveland, Ohio
Deister Concentrator Co., Ft. Wayne, Ind.
Galion Iron Works & Mfg. Co., Galion, Ohio
Gifford-Wood Co., Hudson, N. Y.
Hendrick Mfg. Co., Carbondale, Ohio
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago
Littleford Bros., Cincinnati, Ohio
Lyle Culvert & Road Equipment Co., Minneapolis, Minn.
Morrow Mfg. Co., Wellston, Ohio
Newago Engineering Co., Newago, Mich.
New Holland Machy. Co., New Holland, Pa.
New Jersey Wire Cloth Co., Trenton, N. J.
Robins Conv. Belt Co., New York
H. B. Sackett Screen & Chute Co., Chicago
Smith Engineering Works, Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Machine Co., Kingston, N. Y.
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago
Wickwire Spencer Steel Co., New York

SCREENS, SEWAGE
Dorr Co., New York
Green Bay Fdry. & Mach. Wks., Green Bay, Wis.
Link-Belt Co., Chicago
Simplex Ejector & Aerator Corp., Chicago

SEWAGE DISINFECTION
*Wallace & Tiernan Co., Inc., Newark, N. J.

SEWAGE DISPOSAL APPARATUS
Dorr Co., New York
Link-Belt Co., Chicago
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago

SEWAGE EJECTORS
Pacific Flush Tank Co., Chicago and N. Y.
Simplex Ejector & Aerator Corp., Chicago
Yeomans Bros. Co., Chicago

SEWAGE PUMPS (See Pumps)

SEWER BLOCKS, SEGMENT
American Vit. Products Co., Akron, Ohio
Cannelton Sewer Pipe Co., Cannelton, Ind.
Denver Sewer Pipe & Clay Co., Denver, Col.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis, Mo.
Laclede Christy Clay Prod. Co., St. Louis, Mo.
Macomb Sewer Pipe Works, Macomb, Ill.
Pacific Clay Products Co., Los Angeles, Cal.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Products Co., Akron, Ohio
Standard Fire Brick & Sewer Pipe Co., Pueblo, Col.

SEWER BRACES
*Templeton, Kenly & Co., Chicago

SEWER CLEANING APPARATUS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Hepco Sewer Root Cutter Co., Freeport, Ill.
Self Propelling Nozzle Co., New York
Turbine Sewer Machine Co., Milwaukee

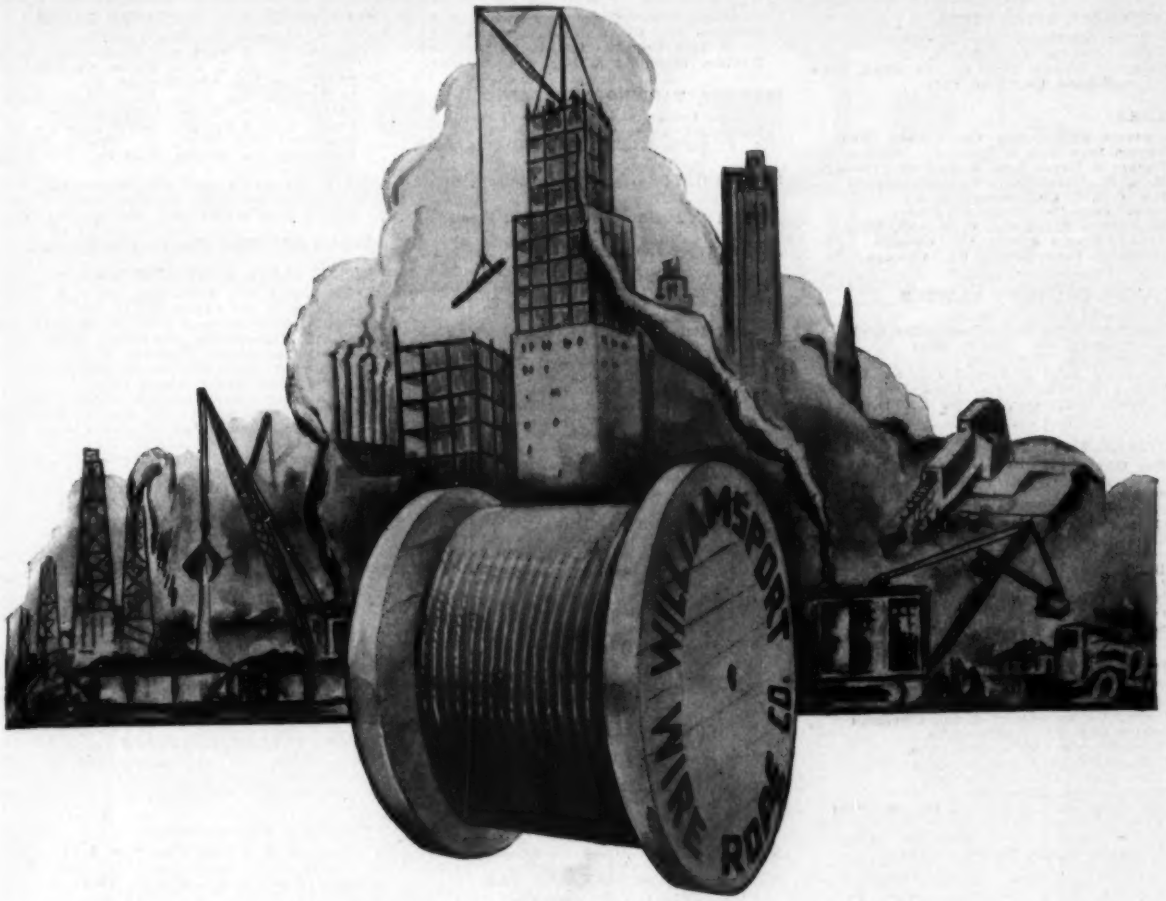
SEWER PIPE AND DRAIN TILE
American Vit. Products Co., Akron, Ohio
Blackmer & Post Pipe Co., St. Louis
William E. Dee Co., Chicago
Denver Sewer Pipe & Clay Co., Denver, Colo.
W. S. Dickey Clay Mfg. Co., Kansas City, Mo.
Evens & Howard Fire Brick Co., St. Louis
Logan Clay Products Co., Logan, Ohio
Ohio Vit. Pipe Co., Uhrichsville, Ohio
Patton Clay Mfg. Co., Patton, Pa.
Red Wing Sewer Pipe Co., Red Wing, Minn.
Robinson Clay Prod. Co., Akron, Ohio
Streator Clay Mfg. Co., Streator, Ill.

SEWER PIPE FORMS (See Forms, Concrete Pipe)

SEWER PIPE JOINT COMPOUNDS
Atlas Mineral Prod. Co., Mertztown, Pa.
Pacific Flush Tank Co., Chicago and N. Y.
Ruberoid Co., New York
Servicised Products Corp., Chicago
Conc. Form Co., Inc., Syracuse, N. Y.
Quinn Wire & Iron Works, Boone, Iowa

SEWER RODS
F. Bissell Co., Toledo, Ohio
Champion Corp., Hammond, Ind.
Turbine Sewer Machine Co., Milwaukee

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.**



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Telfax Tape Marked Factory Certified

It is the only wire rope made that *proves every grade.*

The method of manufacture; the high standard of tests, and finally the Telfax System of Tape Marking *every* grade, so that the user may forever know the make, grade and strength of the rope he is using, has made Williamsport the outstanding Wire Rope in America among men who believe in, and practice "Safety."

Williamsport Wire Rope is made to meet a quality and safety standard —not a price. Safety engineers depend upon it—so can you.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
WILLIAMSPORT, PA.

General Sales Office
PEOPLES GAS BLDG., CHICAGO

Where to Purchase

SHARPENERS, DRILL STEEL
*Sullivan Machinery Co., Chicago
Gardner-Denver Co., Quincy, Ill.
Hardscog Wonder Drill Co., Ottumwa, Iowa
Ingersoll-Rand Co., New York

SHORES
Concrete Engineering Co., Omaha, Neb.
Dayton Sure Grip & Shore Co., Dayton, Ohio
Fischer & Hayes Rope & Steel Co., Chicago
M. & M. Wire Clamp Co., Minneapolis
The O. D. G. Co., Owensboro, Ky.
H. W. Roos Co., Cincinnati, Ohio
Roos-Meyer-Hecht Co., Cincinnati, Ohio
Symons Clamp & Mfg. Co., Chicago
Universal Form Clamp Co., Chicago

SHOVELS, CRAWLING TRACTOR
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, ELECTRIC
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Byers Mach. Co., Ravenna, Ohio
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
Ohio Power Shovel Co., Lima, O.
Speeder Mchy. Corp., Cedar Rapids, Iowa

SHOVELS, GASOLINE
*Bay City Shovels, Inc., Bay City, Mich.
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Insley Mfg. Co., Indianapolis
*Koehring Co., Milwaukee, Wis.
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
*Trackson Co., Milwaukee
American Hoist & Derrick Co., St. Paul
American Steel Dredge Co., Ft. Wayne, Ind.
Austin Machine Corp., Muskegon, Mich.
Byers Mach. Co., Ravenna, Ohio
General Excavator Co., Marion, Ohio
Harnischfeger Corp., Milwaukee, Wis.
Keystone Driller Co., Beaver Falls, Pa.
Link-Belt Co., Chicago
Marion Steam Shovel Co., Marion, Ohio
McMyler Interstate Co., Cleveland, Ohio
Mead-Morrison Mfg. Co., Boston
Northwest Engineering Works, Chicago
Ohio Power Shovel Co., Lima, O.
Orton Crane & Shovel Co., Chicago
Speeder Mchy. Corp., Cedar Rapids, Iowa
Star Drilling Machine Co., Akron, Ohio
Universal Power Shovel Co., Highland Park, Mich.

SHOVELS, STEAM
*Bucyrus-Erie Co., Erie, Pa.
*Industrial Brownhoist Corp., Cleveland
*Osgood Company, Marion, Ohio
*Thew Shovel Co., Lorain, Ohio
American Hoist & Derrick Co., St. Paul
Marion Steam Shovel Co., Marion, Ohio
Orton Crane & Shovel Co., Chicago
Keystone Driller Co., Beaver Falls, Pa.

SHOVELS, SPADES AND SCOOPS
American Mfg. Co., Chattanooga, Tenn.
Ames Shovel & Tool Co., Boston
Baldwin Tool Works, Parkersburg, W. Va.
Beall Bros. Co., Alton, Ill.
Conneaut Shovel Co., Conneaut, Ohio
Indiana Shovel Co., New Castle, Ind.
Jackson Shovel Co., Montpelier, Ind.
Pittsburgh Shovel Co., Pittsburgh, Pa.
Wood Shovel & Tool Co., Piqua, Ohio
Wyoming Shovel Works, Wyoming, Pa.

SIDEWALK AND ROAD FORMS (See Forms, Concrete)

SIGNS, STREET AND ROAD
Alumoyd Sign & Signal Co., Chicago
Auto Sign Display Co. of Missouri, St. Louis, Mo.
Baltimore Enamel & Novelty Co., Baltimore
Elkhart Foundry & Machine Co., Elkhart, Ind.
Everne-Century Sign Co., Boston
Ingram-Richardson Mfg. Co., Beaver Falls, Pa.
A. D. Joslin Mfg. Co., Manistee, Mich.
Lyle-Signs, Minneapolis, Minn.
Municipal Street Sign Co., New York
Niles Machine Co., Lebanon, N. H.
Redflex Signal Co., Cleveland, Ohio
Rochester Street Signal Co., Rochester, N. Y.
Standard Mfg. Co., Cedar Falls, Iowa
Union Iron Products Co., E. Chicago, Ind.
Western Stamping & Mfg. Co., St. Paul

SLEEVES, TAPPING AND VALVE
Mueller Company, Decatur, Ill.
Rensselaer Valve Co., Troy, N. Y.
A. P. Smith Mfg. Co., East Orange, N. J.

SLUICE GATES (See Gates, Sluice)

SMOKE STACKS (See Chimneys, Steel)

SNOW REMOVAL MACHINERY
*Allis-Chalmers Mfg. Co., Springfield, Ill.
*Austin-Western Road Machinery Co., Chicago
*Baker Mfg. Co., Springfield, Ill.
*Barber-Greene Co., Aurora, Ill.
*Caterpillar Tractor Co., San Leandro, Cal.
*Cleveland Tractor Co., Cleveland, Ohio
*Good Roads Machinery Co., Kennett Sq., Pa.
*George Haiss Mfg. Co., New York
*Killefer Mfg. Co., Los Angeles, Calif.
*N. P. Nelson Co., Passaic, N. J.
*W. A. Riddell Co., Bucyrus, Ohio
*Trackson Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago
Byers Mach. Co., Ravenna, Ohio
C. D. Edwards Mfg. Co., Albert Lea, Minn.
Fox Rotary Snow Broom Co., New York
Carl H. Frink, Thousand Islands, N. Y.
The Heil Company, Milwaukee, Wis.
Klauer Mfg. Co., Dubuque, Iowa
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Mack Trucks, Inc., New York
Maine Steel Products Co., So. Portland, Me.
Mead-Morrison Mfg. Co., E. Boston
New England Road Machy. Co., So. Boston, Mass.
Owensboro Ditcher & Grader Co, Owensboro, Ky.
Rotary Snow Plow Co., Minneapolis
Walsh's Holyoke St. Bir. Works, Holyoke, Mass.
Walter Snow Fighters, L. I. City, N. Y.
Wausau Iron Wks., Wausau, Wis.

SNOW FENCING
*Good Roads Machinery Co., Kennett Sq., Pa.
American Fence Const. Co., New York
Wickwire-Spencer Steel Co., New York

SPADES (See Shovels)

SPRAYERS, ASPHALT AND TAR
Kinney Mfg. Co., Boston
Littleford Bros., Cincinnati

SPRAYING MACHINERY FOR TREES
John Bean Mfg. Co., Lansing, Mich.
Deming Co., Salem, Ohio
Field Force Pump Co., Elmira, N. Y.
Fitzhenry-Guptill Co., E. Cambridge, Mass.
Friend Mfg. Co., Gasport, N. Y.
Hardie Mfg. Co., Hudson, Mich.

SPRAY PAINTING MACHINERY (See Painting Machinery)

SPREADERS, SAND
*Good Roads Machy. Co., Kennett Square, Pa.
*Warren Bros. Co., Boston, Mass.
Goroco Mechanical Spreader Co., Philadelphia
Highway Service Co., New Bedford, Mass.
Tarrant Co., Saratoga Springs, N. Y.

SPREADERS, STONE
*Austin-Western Road Machinery Co., Chicago
*The Burch Corp., Crestline, Ohio
Galion Iron Works & Mfg. Co., Galion, Ohio
Shaw-Enochs Tractor Co., Minneapolis
Universal Road Machinery Co., Kingston, N. Y.

STACKS, STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Inc., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honhorst Co., Cincinnati, Ohio
Birmingham Tank Co., Birmingham, Ala.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., Chicago
Heil Co., Milwaukee, Wis.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
New York Central Iron Works Co., Inc., Hagerstown, Md.
Tippett & Wood, Phillipsburg, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STANDPIPES AND ELEVATED TANKS
W. E. Caldwell Co., Louisville, Ky.
Chatta. Bir. & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
R. D. Cole Mfg. Co., Newnan, Ga.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Lancaster Iron Works, Lancaster, Pa.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
J. S. Schofield's Sons Co., Macon, Ga.
Tippett & Wood, Phillipsburg, Pa.
United Iron Works, Inc., Kansas City, Mo.

STEAM SHOVELS (See Shovels, Steam)

STEEL PLATE CONSTRUCTION
*Blaw-Knox Co., Pittsburgh, Pa.
*Connery & Co., Philadelphia
*Heltzel Steel Form & Iron Co., Warren, Ohio
*Joseph Honhorst Co., Cincinnati, Ohio
*Union Iron Works, Hokoben, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chatta. Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Graver Corp., East Chicago, Ill.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
McClintic-Marshall Co., Pittsburgh, Pa.
New York Central Iron Works Co., Inc., Hagerstown, Md.
Pennsylvania Bridge Co., Beaver Falls, Iowa
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.

STEEL SHEET PILING
*Wemlinger, Inc., New York

STEEL TOWERS, CONCRETE
*Insley Mfg. Co., Indianapolis, Ind.
*Lakewood Engr. Co., Cleveland, O.
*Ransome Conc. Machinery Co., Dunellen, N. J

STOKERS, MECHANICAL
Babcock & Wilcox Co., New York
Combustion Engineering Corp., New York
Dayton Stoker Co., Dayton, Ohio
Detroit Stoker Co., Detroit
Green Eng. Co., East Chicago, Ind.
Sanford Riley Stoker Co., Worcester, Mass.
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

STREET AND ROAD SIGNS (See Signs)

STREET BROOMS
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio

STREET CLEANERS' CARTS
Durlach Can & Iron Works, Brooklyn, N. Y.
Rochester Can Co., Rochester, N. Y.
Tarrant Mfg. Co., Saratoga Springs, N. Y.

STREET FLUSHERS AND SPRINKLERS
*Austin-Western Road Mchy. Co., Chicago
*White Co., Cleveland, Ohio
Austin Mfg. Co., Chicago
Autocar Co., Ardmore, Pa.
E. D. Etnyre & Co., Oregon, Ill.
Federal Motor Truck Co., Detroit
Galion Iron Works & Mfg. Co., Galion, Ohio
General Motors Truck Co., Chicago
Heil Co., Milwaukee, Wis.
Charles Hvass & Co., New York
Kinney Mfg. Co., Boston
Mack Trucks, Inc., New York
Municipal Supply Co., South Bend, Ind.
Whitehead & Kales Co., Detroit

STREET LIGHTING EQUIPMENT
*Novo Engine Co., Lansing, Mich.
American Conc. Prod. Co., Forest Park, Ill.
Chicago Conc. Post Co., Chicago
J. B. Clow & Sons, Chicago
Electric Ry. Equipment Co., Cincinnati, Ohio
Holophane Co., New York
King Mfg. Co., Chicago
Line Material Co., So. Milwaukee, Wis.
J. S. Schofield's Sons Co., Macon, Ga.
Union Metal Mfg. Co., Canton, Ohio
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

STREET SIGNS (See Signs, Street)

If you find any errors or omissions in this Where to Purchase list, please send corrections to CONTRACTORS AND ENGINEERS MONTHLY

OSGOOD'S MOVE STONE!

Reserve power with positive crowd to push the dipper into the toughest stone bank and swing it full — constantly available with an Osgood.

THE OSGOOD CO.

MARION OHIO

Where to Purchase

STREET SWEEPERS
*Austin-Western Road Mchy. Co., Chicago
Acme Road Machy. Co., Frankfort, N. Y.
Austin Mfg. Co., Chicago
Butler Mfg. Co., Cleveland, Ohio
Elgin Sales Corp., New York
Kinney Mfg. Co., Boston
Whitehead & Kales Co., Detroit

STREET SWEEPER BROOMS REFILLED
Kendallville Broom & Brush Co., Kendallville, Ind.
Joseph Lay Co., Portland, Ind.
Osborn Mfg. Co., Cleveland, Ohio
Standard Brush & Broom Mfg. Co., Chicago

STUMP PULLERS
*Beebe Bros., Inc., Seattle, Wash.
H. L. Bennett & Co., Westerville, Ohio
Erated Mfg. Co., Portland, Ohio
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
John Waldron Corp., New Brunswick, N. J.

SUBGRADING MACHINES
*Blaw-Knox Co., Pittsburgh, Pa.
*Koehring Co., Milwaukee
*Lakewood Eng. Co., Cleveland, Ohio
Tod Carr & Co., Chicago
The Hug Co., Highland, Ill.
Shaw-Enochs Tractor Co., Minneapolis

SURFACERS & GRINDERS, CONCRETE
*Concrete Surfacing Machy. Co., Cincinnati
*Tousley Tool Co., Cleveland
Chicago Pneumatic Tool Co., New York
Cleveland Pneumatic Tool Co., Cleveland
The Dallett Co., Philadelphia
Ingersoll-Rand Co., New York

SURVEYORS' INSTRUMENTS (See Instruments)

SWITCHBOARDS
Allis-Chalmers Mfg. Co., Milwaukee
General Electric Co., Schenectady, N. Y.
Wagner Electric Mfg. Co., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TAMPERS, PNEUMATIC
*Independent Pneumatic Tool Co., Chicago, Ill.
Chicago Pneumatic Tool Co., New York
Ingersoll-Rand Co., New York

TAMPING MACHINES, CONCRETE BLOCK
*Cement Block Machinery Co., Newark, N. J.
Zagelmeyer Cast Stone Block Mchy. Co., Bay City, Mich.

TANKS, AIR COMPRESSOR
*Connery & Co., Inc., Philadelphia
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
Chicago Bridge & Iron Works, Chicago
Chicago Pneumatic Tool Co., New York
Curtis Pneu. Mchy. Co., St. Louis, Mo.
Graver Corp., East Chicago, Ind.
Heil Co., Milwaukee, Wis.
Indiana Air Pump Co., Indianapolis
Ingersoll-Rand Co., New York
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Engine & Boiler Works, Erie, Pa.
National Tube Co., Pittsburgh, Pa.
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh, Pa.
Westinghouse Tract. Brake Co., Wilmerding, Pa.
Worthington Pump & Mchy. Co., New York

TANKS, STEEL
*Columbian St. Tank Co., Kansas City, Mo.
*Connery & Co., Philadelphia
*Joseph Henhorst Co., Cincinnati, Ohio
Bausman Mfg. Co., Millersville, Pa.
Biggs Boiler Works, Akron, Ohio
Birmingham Tank Co., Birmingham, Ala.
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.
Butler Mfg. Co., Minneapolis, Minn.
J. I. Case Threshing Machine Co., Racine, Wis.
W. E. Caldwell Co., Louisville, Ky.
Canton Art Metal Co., Canton, Ohio
Chattanooga Boiler & Tank Co., Chattanooga, Tenn.
Chicago Bridge & Iron Works, Chicago
Dover Boiler Works, New York
Edwards Mfg. Co., Cincinnati, O.
Farrell Mfg. Co., Joliet, Ill.
C. C. Fouts Co., Middletown, Ohio
Graver Corp., E. Chicago, Ind.
R. Hardesty Mfg. Co., Denver, Colo.
Int'l Comb. Eng. Corp., Chattanooga, Tenn.
Heil Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Lancaster Iron Works, Lancaster, Pa.
Littleford Bros., Cincinnati, Ohio
Nagle Eng. & Boiler Works, Erie, Pa.
New York Central Iron Works Co., Hagerstown, Md.
Pacific Tank & Pipe Co., San Francisco
Petroleum Iron Works Co., Sharon, Pa.
Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
Riter-Conley Co., Pittsburgh, Pa.
W. B. Scaife & Sons, Pittsburgh
United Iron Works, Inc., Kansas City, Mo.

TANKS, WOOD
W. E. Caldwell Co., Louisville, Ky.
G. M. Davis & Son, Palatka, Fla.
Eagle Tank Co., Chicago
Hauser-Stander Tank Co., Cincinnati, Ohio
Kalamazoo Tank & Silo Co., Kalamazoo, Mich.
National Tank & Pipe Co., Portland, Ore.
Pacific Tank & Pipe Co., San Francisco
Redwood Mfrs. Co., San Francisco
A. T. Stearns Lumber Co., Boston
U. S. Wind Eng. & Pump Co., Batavia, Ill.
Wendnagel & Co., Chicago

TAPES, STEEL AND METALLIC
Eugene Dietzgen Co., New York
Keuffel & Esser Co., Hoboken, N. J.
Lufkin Rule Co., Saginaw, Mich.
The L. S. Starrett Co., Athol, Mass.

TAR
*Barrett Co., New York
American Tar Products Co., Pittsburgh, Pa.

TAR KETTLES (See Kettles)

THAWING OUTFITS
*Chausse Oil Burner Co., Elkhart, Ind.
Aeroil Burner Co., West New York, N. J.
Littleford Bros., Cincinnati
Hauck Mfg. Co., Brooklyn, N. Y.

TIES, STEEL
Carnegie Steel Co., Pittsburgh, Pa.
International Steel Tie Co., Cleveland, O.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TIRES, RUBBER (For Motor Trucks)
Firestone Tire & Rubber Co., Akron, O.
Fisk Tire Co., Chicopee Falls, Mass.
Goodrich Rubber Co., Akron, O.
Goodyear Tire & Rubber Co., Akron, O.
Kelly Springfield Tire Co., New York
U. S. Tire Co., New York

TOOL HOUSES, PORTABLE STEEL
*Blaw-Knox Co., Pittsburgh, Pa.
Littleford Bros., Cincinnati, Ohio

TORCHES, OIL HEATING
*Chausse Oil Burner Co., Elkhart, Ind.
*Connery & Co., Philadelphia, Pa.
*Alex Milburn Co., Baltimore, Md.
Hauck Mfg. Co., Brooklyn, N. Y.
Hoosier Paint Works, Ft. Wayne, Ind.
Littleford Bros., Cincinnati
Mead-Morrison Mfg. Co., East Boston, Mass.
Sewall Paint & Varnish Co., Kansas City, Mo.
Sherwin-Williams Co., Cleveland, O.
Tropical Paint & Oil Co., Cleveland, O.
Trascon Laboratories, Detroit, Mich.

TORCHES, WARNING
*Toledo Pressed Steel Co., Toledo, Ohio
McCloskey Torch Co., Toledo, Ohio

TOWERS (See Standpipes and Elevated Tanks)

TRACKS, INDUSTRIAL AND PORTABLE
*Lakewood Eng. Co., Cleveland, O.
Atlas Car & Mfg. Co., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Foundry & Mfg. Co., Columbus, O.
Easton Car & Construction Co., Easton, Pa.
C. W. Hunt Co., Inc., W. N. Brighton, N. Y.
Koppel Ind. Car & Equipment Co., Koppel, Pa.
Sweet's Steel Co., Williamsport, Pa.

TRACTION TREADS (See Treads, Traction)

TRACTORS
*Allis-Chalmers Mfg. Co., Milwaukee
*Atlas Engineering Co., Clintonville, Wis.
*Caterpillar Tractor Co., San Leandro, Calif.
*Cleveland Tractor Co., Cleveland, O.
*Huber Mfg. Co., Marion, O.
*International Harvester Co., Chicago
*John Lauson Co., New Holstein, Wis.
*W. A. Riddell Co., Bucyrus, O.
*Rogers Bros. Corp., Albion, Pa.
Advance-Rumely Thresher Co., Laporte, Ind.
Bates Mfg. Co., Joliet, Ill.
J. I. Case Threshing Machine Co., Racine, Wis.
Electric Wheel Co., Quincy, Ill.
Emerson-Brantingham, Rockford, Ill.
Hart-Parr Co., Charles City, Ia.
Lombard Tractor & Truck Corporation, N. Y.
Mack Trucks, Inc., New York
Mead-Morrison Mfg. Co., E. Boston
Minneapolis Steel & Mach. Co., Minneapolis
Shaw-Enochs Tractor Co., Minneapolis
Wehr Co., Milwaukee

TRACTOR HITCHES
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.
Whitehead & Kales Co., Detroit

TRAFFIC LINE MARKING MACHINES
Carrara Paint Co., Cleveland, O.
Continental Prod. Co., Euclid, O.
Line-O-Graph Co., N. Y.
Littleford Bros., Cincinnati, Ohio

TRAFFIC PAINT
J. E. Bauer Co., Los Angeles, Cal.
Continental Prod. Co., Euclid, O.
E. I. du Pont de Nemours & Co., Wilmington, Del.
Hoosier Paint Wks., Ft. Wayne, Ind.
Hanline Bros., Baltimore, Md.
Tropical Paint & Oil Co., Cleveland, O.

TRAFFIC PLATES
Alan Wood Iron & Steel Co., Philadelphia
American Pressed Steel Co., Philadelphia
Central Iron & Steel Co., Harrisburg, Pa.

TRAFFIC SIGNAL EQUIPMENT
*Toledo Pressed Steel Co., Toledo, Ohio
Acme Traffic Signal Co., Chicago
Alumoyd Sign & Signal Co., Chicago
Amer. Gas Accumulator Co., Elizabeth, N. J.
Auto Sign Display Co. of Mo., St. Louis, Mo.
Cretney Traffic Guide Co., Madison, Wis.
Crouse-Hinds Co., Syracuse, N. Y.
Eagle Signal Sales Corp., Moline, Ill.
Esaco Mfg. Co., Peoria, Ill.
Everna-Century Sign Co., Boston
Griswold Safety Signal Co., Minneapolis
Horni Signal Mfg. Corporation, Newark, N. J.
Line Material Co., South Milwaukee, Wis.
Little Giant Co., Mankato, Minn.
Lyle-Signs, Minneapolis, Minn.
Rochester Street Signal Co., Rochester, N. Y.
Tokheim Oil Tank & Pump Co., Ft. Wayne, Ind.
Traffic Equipment Corp., N. Y.
Union Iron Prod. Co., E. Chicago, Ind.
Welsbach Traffic Signal Co., Philadelphia

TRAILERS FOR TRUCKS AND TRACTORS
*Electric Wheel Co., Quincy, Ill.
*Euclid Crane & Hoist Co., Euclid, O.
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Arcadia Trailer Corporation, Newark, N. J.
Detroit Trailer & Mach. Co., Detroit
Eagle Wagon Works, Auburn, N. Y.
Easton Car & Construction Co., Easton, Pa.
Fruehauf Trailer Co., Detroit, Mich.
Hercules Trailer Mfg. Co., Los Angeles
Imperial Mach. Co., Minneapolis
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Chicago
Little Red Wagon Mfg. Co., Omaha
Miami Trailer-Scraper Co., Troy, O.
Muskogee Iron Wks., Muskogee, Okla.
Smith Trailer Corp., Syracuse, N. Y.
Trailmobile Co., Cincinnati
Troy Trailer & Wagon Co., Troy, O.
Warner Mfg. Co., Beloit, Wis.
Whitehead & Kales Co., Detroit

TRAILERS, HEAVY MACHINERY
*Highway Trailer Co., Edgerton, Wis.
*Rogers Bros. Corporation, Albion, Pa.

TRAILERS, INDUSTRIAL
*Electric Wheel Co., Quincy, Ill.
*Highway Trailer Co., Edgerton, Wis.
*Lakewood Eng. Co., Cleveland, O.
*Rogers Bros. Corporation, Albion, Pa.
*Gustav Schaefer Co., Cleveland
Chase Fdry. & Mfg. Co., Columbus, O.
Clark Tractractor Co., Battle Creek, Mich.
Detroit Trailer & Machinery Co., Detroit
Easton Car & Construction Co., Easton, Pa.
LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa
Lee Trailer & Body Co., Plymouth, Ind.
Miami Trailer-Scraper Co., Troy, O.
Trailmobile Co., Cincinnati
Whitehead & Kales Co., Detroit

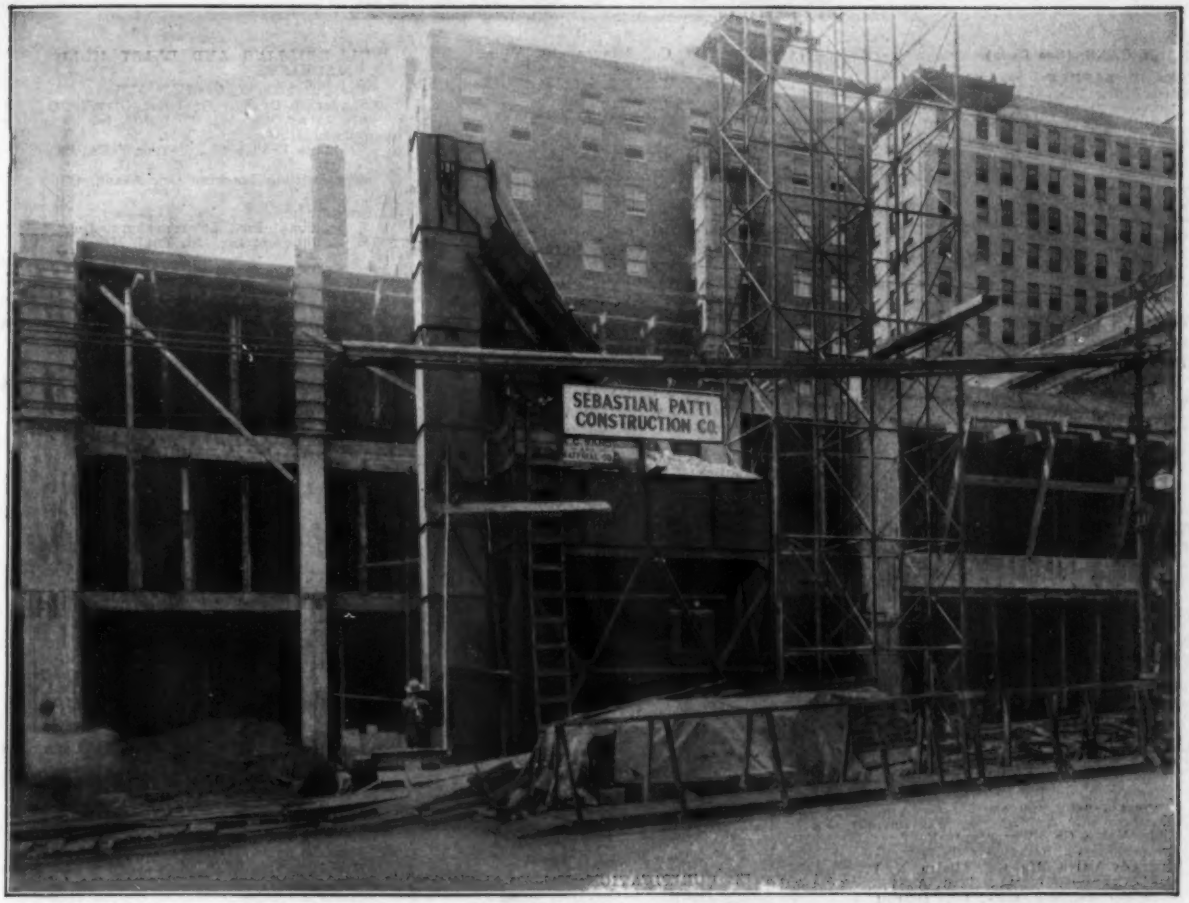
TRAILER COUPLINGS
*Gustav Schaefer Co., Cleveland
Trail-IT Co., St. Paul, Minn.

TRAMWAYS, AERIAL WIRE ROPE (See Aerial Wire Rope Tramways)

TRANSFORMERS
Allis-Chalmers Mfg. Co., Milwaukee
Duncan Elec. Mfg. Co., Lafayette, Ind.
Enterprise Elec. Co., Warren, O.
General Elec. Co., Schenectady, N. Y.
Kuhlman Elec. Co., Bay City, Mich.
Maloney Electric Co., St. Louis, Mo.
Packard Electric Co., Warren, O.
Pittsburgh Trans. Co., Pittsburgh, Pa.
Wagner Elec. Corp., St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

TRANSITS AND LEVELS (See Instruments)

TRANSMISSION MACHINERY, POWER
*Chain Belt Co., Milwaukee.
Allis-Chalmers Mfg. Co., Milwaukee
Dodge Mfg. Corpn., Mishawaka, Ind.
Kent Machine Co., Kent, O.
Link-Belt Co., Chicago
Webster Mfg. Co., Chicago
Weller Mfg. Co., Chicago



A Butler Bin loaded with a bucket elevator solves a lot of problems in city construction

WHERE the curb is the limit for building and everything must be handled inside that limit, Butler Bins fit like a coat of paint.

Aggregates are dumped from motor trucks into the boot of the elevator which conveys same into the bin, then through the measuring or weighing hoppers into the mixer, and from the mixer into the tower elevator by gravity.

Butler Bins have sufficient clearance between columns to accommodate two mixers where large volume and steady production are necessary. A deflecting chute fills first one mixer and then the other from the proportioning hoppers.

Butler Equipment saves room where room is at a premium. It saves in handling costs, too, for with Butler Equipment there is no rehandling or lost motion.

Handle your aggregates for the next job through a Butler Bin. It will simplify the job.

BUTLER
Steel **BINS**

BUTLER BIN COMPANY, *Waukesha, Wisconsin*
Representatives in fifty principal cities.

Where to Purchase

TRASH CANS (See Cans)

TREADS, SAFETY
- *Blaw-Knox Company, Pittsburgh, Pa.
- American Abrasive Metals Co., N. Y.
- American Mason Safety Tread Co., Lowell, Mass.
- Concrete Steel Co., N. Y.
- Norton Co., Worcester, Mass.

TREADS, TRACTION
- *Caterpillar Tractor Co., San Leandro, Cal.
- *Creeper Wheel Co., Reading, Pa.
- *Trackson Co., Milwaukee
- Belle City Mfg. Co., Racine, Wis.
- Electric Wheel Co., Quincy, Ill.
- Tractor Grip Wheel Co., Toledo, O.
- Whitehead & Kales Co., Detroit

TRENCH EXCAVATORS (See Excavators)

TRENCH PUMPS (See Pumps, Contractors')

TRUCKS, TANK & SPRINKLER (See Wagons, Tank & Sprinkler)

TURBINES
- Allis-Chalmers Mfg. Co., Milwaukee
- De Laval Steam Turbine Co., Trenton, N. J.
- General Electric Co., Schenectady, N. Y.
- Ingersoll-Rand Co., N. Y.
- Terry Steam Turbine Co., Hartford, Conn.
- Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

TURNTABLES FOR MOTOR TRUCKS
- *Blaw-Knox Co., Pittsburgh, Pa.
- Champion Engine Co., Kenton, O.
- Easton Car & Construction Co., Easton, Pa.
- Freeman Mfg. Co., Racine, Wis.
- Hug Co., Highland, Ill.
- Western Structural Co., Moline, Ill.

VALVES, CHECK
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Coffin Valve Co., Boston
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Mich. Valve & Foundry Co., Detroit
- Rensselaer Valve Co., Troy, N. Y.

VALVES, GATE AND INDICATOR POSTS
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- Coffin Valve Co., Boston
- Columbian Iron Works, Chattanooga, Tenn.
- Crane Company, Chicago
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Iowa Valve Co., Oskaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Michigan Valve & Fdry. Co., Detroit
- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.
- Waterous Co., St. Paul
- R. D. Wood & Co., Philadelphia

VALVES FOR GASOLINE ENGINES
- *Industrial Engine Parts Co., Inc., Cleveland

VALVES, RELIEF
- *Neptune Meter Co., New York

VALVES, TAPPING
- Eddy Valve Co., Waterford, N. Y.
- Hays Mfg. Co., Erie, Pa.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Co., Troy, N. Y.
- Michigan Valve & Foundry Co., Detroit
- Rensselaer Valve Co., Troy, N. Y.
- Waterous Co., St. Paul
- A. P. Smith Mfg. Co., E. Orange, N. J.

VALVE BOXES AND HOUSINGS
- *Central Foundry Co., N. Y.
- Chapman Valve Mfg. Co., Indian Orchard, Mass.
- H. W. Clark Co., Mattoon, Ill.
- J. B. Clow & Sons, Chicago
- Columbian Iron Works, Chattanooga, Tenn.
- Darling Valve & Mfg. Co., Williamsport, Pa.
- Eddy Valve Co., Waterford, N. Y.
- Iowa Valve Co., Oskaloosa, Ia.
- Kennedy Valve Mfg. Co., Elmira, N. Y.
- Ludlow Valve Mfg. Co., Troy, N. Y.
- Mueller Co., Decatur, Ill.
- Rensselaer Valve Co., Troy, N. Y.
- A. P. Smith Mfg. Co., E. Orange, N. J.
- Waterous Co., St. Paul
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VOTING EQUIPMENT FOR CITIES
- Automatic Registering Machine Co., Jamestown, N. Y.
- Ideal Voting Booth Co., Sullivan, Ind.
- Douglas Manufacturing Co., Crete, Nebr.
- Pennsylvania Construction Co., Marietta, Pa.
- Korff Manufacturing Co., Lansing, Mich.
- Van Dorn Iron Works Co., Cleveland, O.

WAGONS (See Dump Carts and Wagons)

WAGON BODIES (See Dump Bodies)

WAGON LOADERS (See Loaders, Gravel)

WAGONS & TRUCKS, TANK & SPRINKLER
- *Joseph Honhorst Co., Cincinnati, O.
- Acme Road Machinery Co., Frankfort, N. Y.
- Butler Mfg. Co., Minneapolis, Minn.
- J. I. Case Threshing Machine Co., Racine
- Galion Iron Works & Mfg. Co., Galion, Ohio
- Heil Co., Milwaukee, Wis.
- Mack Trucks, Inc., New York

WALL TIES
- Berger Mfg. Co., Canton, O.
- Concrete Steel Co., N. Y.
- Consolidated Exp. Metal Co., Wheeling, W. Va.
- Hawley Mfg. Co., Chicago
- M. & M. Wire Clamp Co., Minneapolis
- Milwaukee Corr. Co., Milwaukee, Wis.
- Niagara Metal Stamp Corp., Niagara Falls, N. Y.

WASHERS, SAND AND GRAVEL
- Allis-Chalmers Mfg. Co., Milwaukee
- Jeffrey Mfg. Co., Columbus, O.
- Link-Belt Co., Chicago
- Smith Engineering Works, Milwaukee
- Stephens-Adamson Mfg. Co., Aurora, Ill.

WATCHES, STOP
- *Sterling Stop Watch Co., N. Y.

WATER MAIN TAPPING MACHINES
- Glauber Brass Mfg. Co., Cleveland
- Hays Mfg. Co., Erie, Pa.
- Mueller Co., Decatur, Ill.
- A. P. Smith Mfg. Co., E. Orange, N. J.

WATER METERS (See Meters, Water)

WATERPROOFING COMPOUNDS AND MATERIALS
- *Barber Asphalt Co., Philadelphia, Pa.
- *Barrett Company, N. Y.
- *Philip Carey Co., Cincinnati, O.
- *Standard Oil Co. (Indiana), Chicago
- Anti-Hydro Waterproofing Co., Newark, N. J.
- Atlantic Refining & Asphalt Corp., Philadelphia
- Euclid Chemical Co., Cleveland
- Genfire Steel Co., Youngstown, O.
- Master Builders Co., Cleveland, O.
- Minwax Co., N. Y.
- Ruberoid Co., N. Y.
- Sandusky Cement Co., Cleveland, O.
- Sonneborn Sons, Inc., N. Y.
- Texas Company, N. Y.
- Toch Brothers, N. Y.
- Truscon Laboratories, Detroit, Mich.

WATER PURIFICATION (See also Filters)
- *Wallace & Tiernan Co., Inc., Newark, N. J.
- Cochrane Corp., Philadelphia
- Paradon Eng. Co., Arlington, N. J.
- R. U. V. Co., N. Y.

WATER PURIFICATION CHEMICALS
- Arnold Hoffman & Co., Inc., N. Y.
- E. I. du Pont de Nemours & Co., Wilmington, Del.
- Electro Bleaching Gas Co., N. Y.
- General Chemical Co., N. Y.
- Hooker Electrochemical Co., N. Y.
- Mathieson Alkali Works, Inc., N. Y.
- Pennsylvania Salt Mfg. Co., Philadelphia

WATER SOFTENERS
- American Water Softener Co., Philadelphia
- Cochrane Corp., Philadelphia
- Graver Corp., E. Chicago, Ind.
- International Filter Co., Chicago
- Permutit Co., N. Y.
- W. B. Scaife & Sons, Pittsburgh, Pa.
- Wayne Tank & Pump Co., Ft. Wayne, Ind.

WATER WASTE DETECTION
- Empire Electric & Water Co., Inc., N. Y.
- Pitometer Co., N. Y.
- Simplex Valve & Meter Co., Philadelphia

WATER WHEELS
- Allis-Chalmers Mfg. Co., Milwaukee
- J. Loffel & Co., Springfield, O.
- I. P. Morris and De La Vergne, Inc., Hydr. Div., Philadelphia
- Newport News Shipbuilding & Dry Dock Co., Newport News, Va.
- Pelton Water Wheel Co., San Francisco
- S. Morgan Smith Co., York, Pa.
- Worthington Pump & Machinery Corp., N. Y.

WATER WORKS PUMPS (See Pumps)

WEIGHING MACHINES
- *Conveying Weigher Co., N. Y.

WELDING APPARATUS
- *Alex. Milburn Co., Baltimore, Md.
- *Oxweld Acetylene Co., L. I. City, N. Y.
- Burke Electric Co., Erie, Pa.
- General Electric Co., Schenectady, N. Y.
- Lincoln Electric Co., Cleveland, O.
- Macleod Co., Cincinnati, O.
- Smith's Inventions, Inc., Minneapolis, Minn.
- U. S. Light & Heat Corp., Niagara Falls
- Westinghouse Electric & Mfg. Co., E. Pittsburg, Pa.
- Wilson Welder & Metals Co., Inc., Hoboken, N. J.

WELLS, CONCRETE
- Kelly Well Co., Grand Island, Neb.

WELLS, GRAVEL WALL
- Layne & Bowler, Inc., Memphis, Tenn.

WELL-DRILLING AND BLAST HOLE MACHINES
- *The Buech Corp., Crestline, Ohio
- *Sanderson Cyclone Drill Co., Orrville, O.
- Armstrong Mfg. Co., Waterloo, Ia.
- Burkhardt Co., Kiel, Wis.
- Keystone Driller Co., Beaver Falls, Pa.
- Loomis Machine Co., Tiffin, O.
- Star Drilling Machine Co., Akron, O.

WELL SCREENS
- A. D. Cook, Inc., Lawrenceburg, Ind.
- E. E. Johnson, Inc., St. Paul, Minn.

WHEELBARROWS
- *General Wheelbarrow Co., Cleveland, O.
- *Lansing Co., Lansing, Mich.
- Asheboro Wheelbarrow Co., Asheboro, No. Carolina
- American Steel Scraper Co., Sidney, Ohio
- Case Crane & Engg. Co., Columbus, Ohio
- Chattanooga Wheelbarrow Co., Chattanooga, Tenn.
- Cleveland Wheelbarrow Co., Cleveland, O.
- Fairbanks Co., N. Y.
- Jackson Mfg. Co., Harrisburg, Pa.
- Puffer-Hubbard Mfg. Co., Minneapolis
- Sidney Steel Scraper Co., Sidney, O.
- Sterling Wheelbarrow Co., Milwaukee
- Toledo Wheelbarrow Co., Toledo, O.

WHEELS FOR ALL USES
- *Electric Wheel Co., Quincy, Ill.

WHEELS, CRAWLER TYPE FOR WAGONS
- *Creeper Wheel Co., Reading, Pa.

WINCHES
- *Beebe Bros., Inc., Seattle, Wash.
- *Brown Clutch Co., Sandusky, O.
- *Clyde Iron Works Sales Co., Duluth, Minn.
- *Dobbie Foundry & Mach. Co., Niagara Falls
- *Lidgerwood Mfg. Co., Elizabeth, N. J.
- *Mundy Sales Corp., N. Y.
- *Gustav Schaefer Co., Cleveland
- Advance-Rumely Thresher Co., La Porte, Ind.
- Bethlehem Steel Co., Bethlehem, Pa.
- Chisholm-Moore Mfg. Co., Cleveland, O.
- Dake Engine Co., Grand Haven, Mich.
- Erstad Mfg. Co., Portland, Ore.
- John T. Horton Co., New York
- Ingersoll-Rand Co., New York
- Mead-Morrison Mfg. Co., E. Boston
- Muskogee Iron Wks., Muskogee, Okla.
- Stephens-Adamson Mfg. Co., Aurora, Ill.
- Street Bros. Mach. Works, Chattanooga

WINDOW FRAMES AND SASH (Metallic)
- *Truscon Steel Co., Youngstown, O.
- Wm. Bayley Co., Springfield, O.
- Detroit Steel Prod. Co., Detroit
- E. D. Frederick Co., Holyoke, Mass.
- Genfire Steel Co., Youngstown, O.
- David Lupton's Sons Co., Philadelphia
- Penn Metal Co., Boston
- Sykes Co., Chicago

WIRE AND CABLE
- *American Steel & Wire Co., Chicago
- *Williamsport Wire Rope Co., Williamsport, Pa.
- American Cable Co., N. Y.
- Copperweld Steel Co., Glassport, Pa.
- Fischer & Hayes Rope & Steel Co., Chicago
- General Electric Co., Schenectady, N. Y.
- Habirshaw Cable & Wire Corp., N. Y.
- Hazard Wire Rope Co., Wilkesbarre, Pa.
- Mac Whyte Co., Kenosha, Wis.
- Marion Insulated Wire & Rubber Co., Chicago
- National India Rubber Co., Bristol, R. I.
- New York Insulated Wire Co., N. Y.
- Okonite Co., Passaic, N. J.
- John A. Roebling's Sons Co., Trenton, N. J.
- Safety Cable Co., N. Y.
- Simplex Wire & Cable Co., Boston
- Standard Underground Cable Co., Pittsburgh, Pa.
- Tubular Woven Fabric Co., Pawtucket, R. I.

WIRE MESH REINFORCEMENT
- *American Steel & Wire Co., Chicago
- *Truscon Steel Co., Youngstown, O.
- National Steel Fabric Co., Pittsburgh, Pa.
- Wickwire-Spencer Steel Co., N. Y.

WIRE ROPE FITTINGS
- *L. P. Green, Chicago
- John A. Roebling's Son Co., Trenton, N. J.

WIRE ROPE (See Rope, Wire)

WOOD BLOCKS (See Paving Blocks)

WOODWORKING MACHINES
- *American Saw Mill Machinery Co., Hackettstown, N. J.
- *C. H. & E. Mfg. Co., Milwaukee, Wis.
- R. L. Carter Co., Phoenix, N. Y.
- Jaeger Portable Power Corp., Detroit
- Jones Superior Machine Co., Chicago
- Master Woodworker Mfg. Co., Detroit

** Indicates that the manufacturer carries an advertisement. See index facing inside back cover.**

Pick this Team

and you've picked winners for any job

TRACKSON
McCORMICK-DEERING

Crawler Tractors

Head You Straight to Profit—No Matter What the Odds • • •

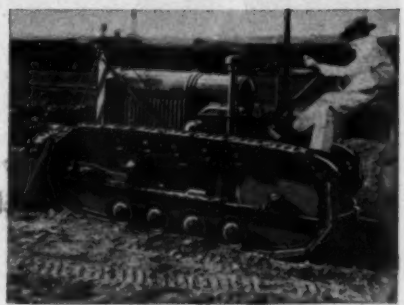
A GREAT team! The perfect combination for mastering every job, the year 'round. Performance for every purpose, effective and economical . . . Trackson Models LH and DH—one for agile power, one for heavy duty.

When the activity is most intense, you'll need winners—to set the pace, show the way to better work, quicker profits. With dominant, sure-footed power, they meet the most difficult requirements in hauling, digging, grading, scraping, backfilling.

Head straight to certain profits with Trackson Equipment—known wherever hours mean dollars. The Model LH has increased ground-gripping ability, retains the standard speeds of the McCormick-Deering (agricultural) tractor, and turns in its own length. The Model DH is built for heavy duty, with tremendous power and tenacious traction.

With supple strength, Trackson Shovels, Loaders, Cranes, Bulldozers and Hoists bring to any task outstanding performance and built-in reliability.

Learn how you benefit by low first cost, remarkable economy of operation and maintenance, and unusual adaptability of Trackson Equipment—saving time, men and money. WRITE TODAY FOR FULL DETAILS!



(Above) The Model LH Trackson McCormick-Deering for speed and agile power.

(Below) The Model DH Trackson McCormick-Deering for heavy duty jobs. Shown with Trackson Bulldozer.

Trackson Company

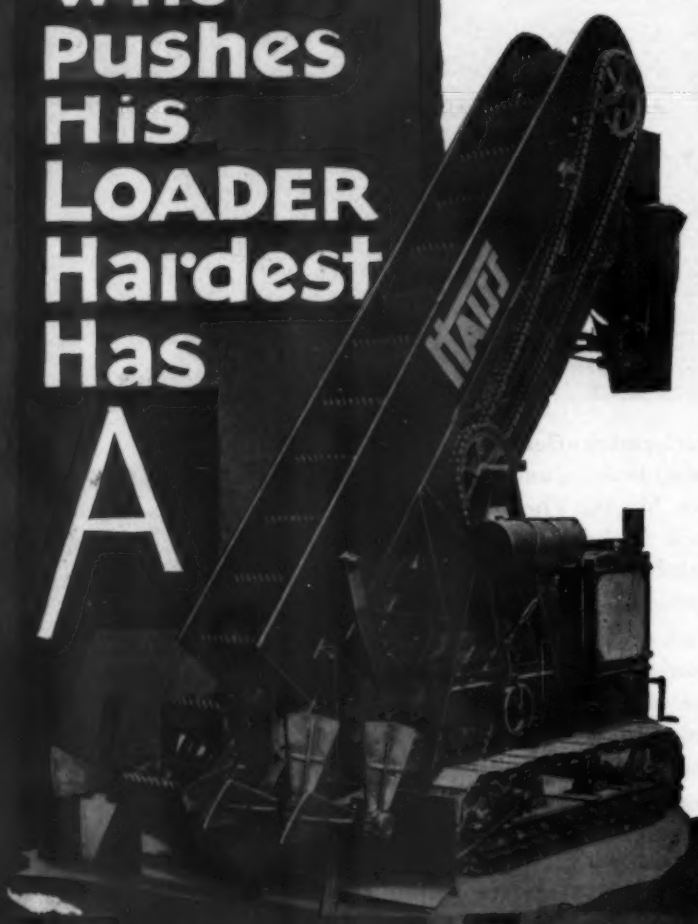
FULL-CRAWLERS & TRACTOR EQUIPMENT

519 CLINTON ST. MILWAUKEE, WIS.

FULL-CRAWLERS ★ BULLDOZERS ★ LOADERS ★ SHOVELS ★ CRANES

Ten to One . . .

The Man Who Pushes His LOADER Hardest Has A



BECAUSE it is bigger, heavier and more powerful, the Haiss Creeper Loader has a work-ability second to none. And there's more than enough extra life in its Manganese and Alloy Steel digging parts to warrant the slight difference in initial cost.

Haiss Loaders have a Special Loader Transmission which houses (sealed in oil) the slow speed "Crowding Drive"—a low speed that keeps the propellers and buckets constantly digging against the pile.

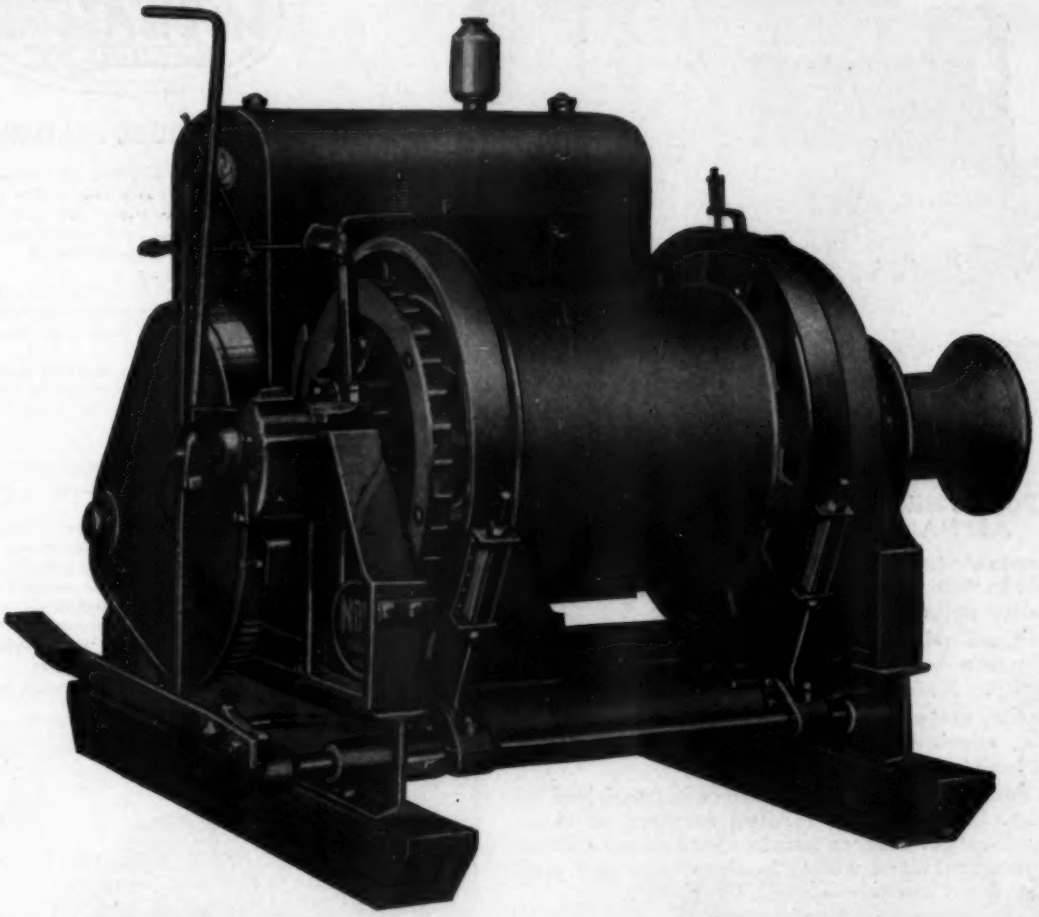
There are many other points of interest to you in Catalog 527—Why not ask for a copy?

GEORGE HAISS MANUFACTURING CO., *Inc.*
142nd St. and Park Ave.
New York, N.Y.
Representatives in Principal Cities

HAISS LOADER

The Loader That Can Crowd Continuously

THE NEW HI-SPEED HOIST



For Faster—Safer Material Handling

Here's a brand new Novo Hi-Speed Hoist for the contractor who wants faster bucket and elevator handling—faster lifting of mortar, bricks, and other materials on building construction jobs.

For the large drum, operated by a powerful Novo 4 Cylinder Engine or electric motor, "takes in" and "lets out" the cable at a new high speed that means more loads per hour to the top of the tower or mast.

Double brakes—one at either end of the drum—with friction blocks of a special asbestos composition, give the operator perfect load control at all times.

Write for complete information on the new Novo Hi-Speed Hoists that can speed up your building construction work.

NOVO ENGINE COMPANY, 216 Porter Street, Lansing, Michigan
CLARENCE E. BEMENT, Vice-Pres. and Gen. Mgr.

NOVO

PUMPS—ENGINES—HOISTS

Service, parts and sales in over 70 cities

CHAMPION DISTRIBUTOR—800 GAL.
TYPE PU
MODEL Y-74

Bulletin
K B D

Good Roads MACHINERY

NOTE THESE FEATURES

Flanged fittings with wire inserted asbestos gaskets. A non-leaking system
Tanks of fire-box steel. Our "rivet-weld" method insures double strength tank construction with minimum weight
No exposed piping
Tubes and flues of best charcoal iron
Manifolds are strongest and lightest known—from alloy of aluminum—lengths 4 feet to 26 feet
Snap connections for attaching manifolds and filling hose. No wrenches required—connections made in "seconds" not "minutes"
More heating area
Two-speed clutch. Amidship gear box. A multiplicity of pump speeds irrespective of truck speed
Self-aligning roller-bearings—Alemite lubrication fittings used throughout
Entire system protected by patented relief, control and check valve, meaning safety and simplicity in operation
Heating system embodies internal fire-box principle, eliminating warped shell or flue sheets and leaking flues
And many more equally important features

CHAMPION DISTRIBUTORS

Heater Type

FOR THE MECHANICAL APPLICATION OF ASPHALTS, TARS AND HEAVY PRODUCTS

Adaptable to mounting on any truck of sufficient capacity. Built in 600-, 800- and 1,000-gallon capacities—larger or smaller units furnished if desired.

Equipped with special VIKING Pumps—only two working parts—no plungers, valves or springs. 350 g.p.m. caacity. Reversible feature.

Heating system embodies internal fire-box principle, eliminating warped shell or flue sheets and leaking flues.

On double unit, Type PU, power is furnished by 20-hp. LeRoi engine, located forward of tank. This location assures ample ventilation, a clean engine, protected when "backing up," and well away from burners—SAFETY FIRST.

NOW THE CHAMPION COLD APPLICATION OIL DISTRIBUTORS

Especially constructed for the application of the lighter road oils, requiring no preheating.
Adaptable for mounting on small capacity, high-speed trucks.
An ideal distributor at an attractive price for any contractor, municipality, county or state roadway department.

Standard Sizes

500 gallon 600 gallon

Other sizes if desired.

Adaptable to mounting on any standard truck chassis of sufficient capacity, equipped with power take-off attachment.

Bulletin KCO

CHAMPION COLD OIL DISTRIBUTOR—ON GRAHAM 3-TON HIGH SPEED CHASSIS—MODEL R E S

The Good Roads Machinery Co. Inc.

"A business established and in continuous operation for fifty-one years at Kennett Square—in Pennsylvania."

Branches at

NEW YORK PHILADELPHIA
PITTSBURGH CHICAGO
WATERTOWN, MASS.

Dependable Power for Every Purpose

CONTINENTAL MOTORS · AMERICA'S STANDARD

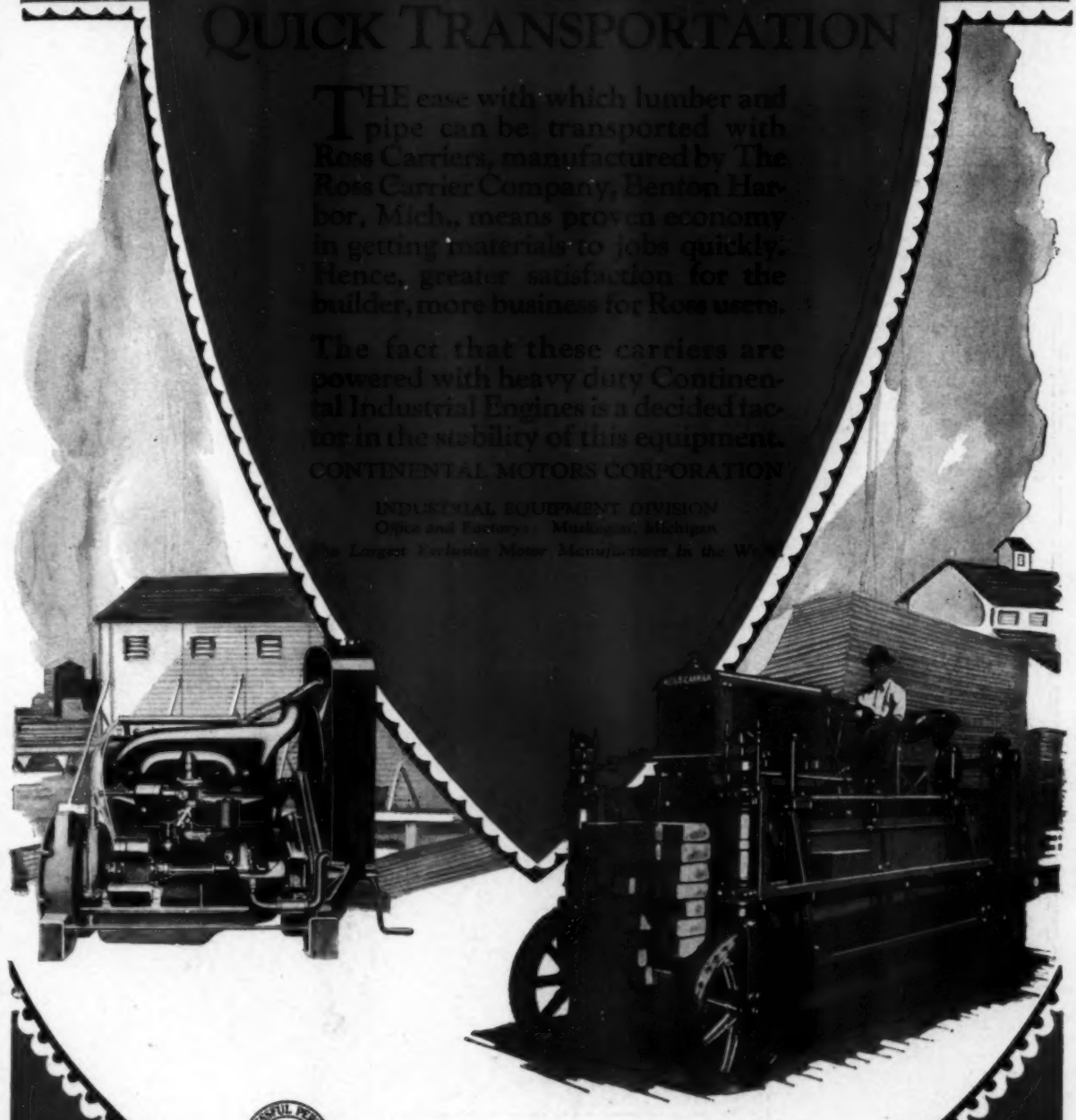
QUICK TRANSPORTATION

THE ease with which lumber and pipe can be transported with Ross Carriers, manufactured by The Ross Carrier Company, Benton Harbor, Mich., means proven economy in getting materials to jobs quickly, fience, greater satisfaction for the builder, more business for Ross users.

The fact that these carriers are powered with heavy duty Continental Industrial Engines is a decided factor in the stability of this equipment.

CONTINENTAL MOTORS CORPORATION

INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan
The Largest Exclusive Motor Manufacturer in the World



SUCCESSFUL PERFORMANCE · A.G.C.A.

Continental Engines

HOMELITE PRESENTS CONSTRUCTION HELPERS ALL STAR CAST

HOMELITE 110-VOLT GENERATOR

Measures 21" x 21" x 14". Weighs 110 lbs. with built-in Homelite air-cooled gasoline engine.

HOMELITE CENTRIFUGAL PUMP

Weighs 95 lbs. with built-in Homelite air-cooled gasoline engine. Capacity up to 7500 gallons per hour.

HOMELITE SELF-PRIMING CENTRIFUGAL PUMP

A two-purpose pump—for volume and seepage. No foot valve needed. Weighs less than a 100 lbs. with built-in Homelite air-cooled gasoline engine. Capacity up to 6000 gal. per hr.

HOMELITE SELF-PRIMING ELECTRIC CENTRIFUGAL PUMP

With built-in G. E. 1½ hp. motor, 110 or 220 volts, A.C., 60 cycle, single phase, 110, 220 or 550 volts, three phase. Weighs 135 lbs. Capacity up to 6000 gal. per hr.

HOMELITE BLOWER

Weighs 70 lbs. with built-in Homelite air-cooled gasoline engine. Capacity up to 2000 cu.ft. of air per minute.

ALL PORTABLE BY ONE MAN—BUILT-IN HOMELITE AIR-COOLED GASOLINE ENGINE

HOMELITE CORPORATION

71 RIVERDALE AVE., PORTCHESTER, N. Y. ® 2951

THE RIGHT TOOL SAVES TIME

FOR BETTER CONCRETE WORK

Here is a tool designed especially for cement contractors and those engaged in the building of concrete walls, walks and drives. Shank and handle are offset from plane of blade so that it can be pushed down flush with the side of the form. This brings fine concrete toward the form and insures a smooth surface, after form is removed. Improves the appearance and makes a more satisfactory job. Saves time over a makeshift tool not designed for this work.

Blade is 7″ wide, slotted. Handle—selected ash.

The brand True Temper is burned in the handle to mark each tamper as the best tool of its kind that can be made.

THE AMERICAN FORK & HOE CO.
1937 Keith Bldg.,
CLEVELAND, OHIO

Makers of Farm and Garden Tools for over 100 years.

If your dealer has not yet stocked the Concrete Tamper, Cat. No. 7CT, send us his name and $1.60 and we will supply you direct, prepaid.

Concrete Tamper

FREE
on Request

Heavy Steel Goods or Industrial Tool Catalog. Describes over 50 tools for mill, mine, factory and coal yard.

TRUE TEMPER TOOLS

Dietz
MONARCH
The leading light in Hot Blast lanterns

DIETZ Red Globe Lanterns convey roadside warnings that are universally understood and instinctively obeyed. They afford utmost protection at minimum cost.

Use RED! *No other color means danger*

Dietz "MONARCH" Lanterns are the leading lights of hot blast type for roadside work. Their popularity rests upon a long record of dependable service. When the higher lighting power of Dietz cold-blast lanterns is not an essential, Dietz "Monarchs" are a logical choice.

Use Dietz Lanterns for serviceability—for economy.

R. E. DIETZ COMPANY
NEW YORK
Largest Makers of Lanterns in the World
FOUNDED 1840

DIETZ LANTERNS

"Cut'er through—we'll make it with the Monarch!"

ALLIS-CHALMERS A-C MILWAUKEE

. . . and through she goes!

Thick brush, heavy timber, and root-filled soil are nothing to the Allis-Chalmers-Monarch, when the surveyor says "Here's where the road will go!"

Monarch strength and power overcomes every natural obstacle in road-building. Brush and hedge are quickly yanked—big trees are dragged out by their roots. Then come the plows, the scoops, and the graders. The Monarch pulls them all, never stopping because of over-loads or soft footing. Turning virgin soil into finished roads, at a remarkable speed and saving, is an easy job the Monarch would like to do for you too!

Superior mechanical features distinguish the Allis-Chalmers-Monarch. It will pay you well to investigate them. Write for literature and prices.

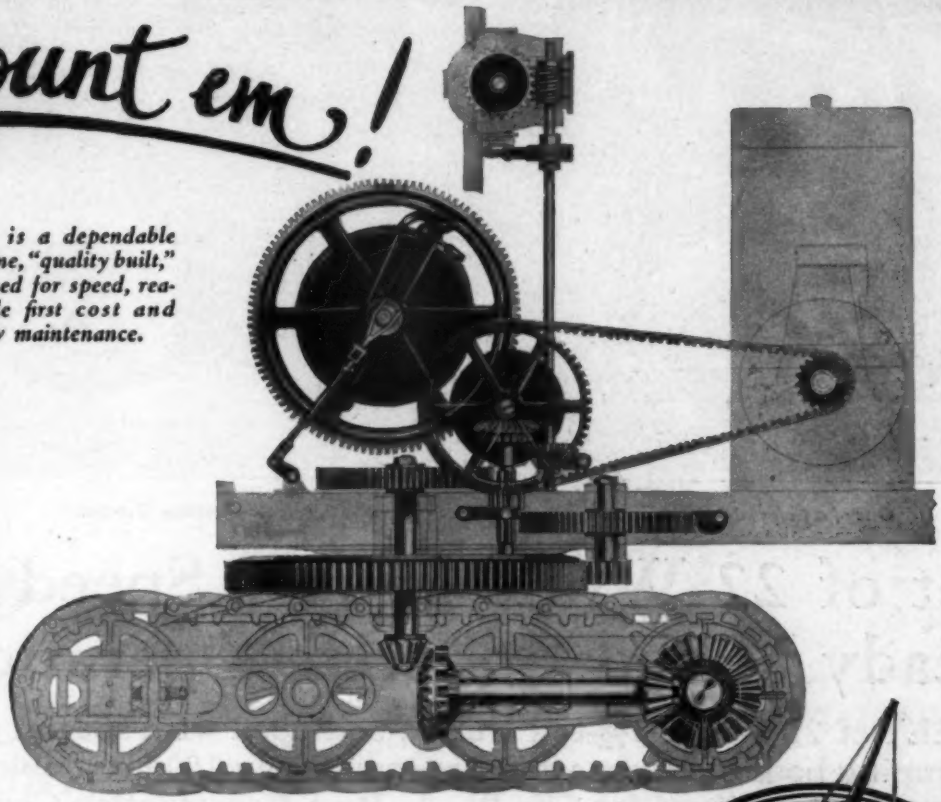
ALLIS-CHALMERS MANUFACTURING CO.
Specialists in Power Machinery Since 1846
MONARCH TRACTORS DIVISION SPRINGFIELD, ILL.

Allis-Chalmers
Monarch Tractors

Only Sixteen Gears in the Entire Gear Train—

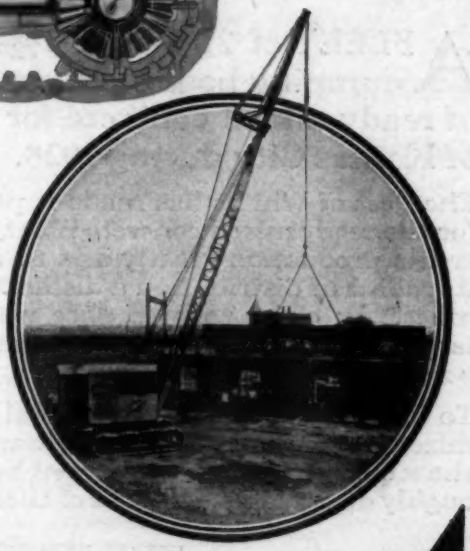
count em!

Here is a dependable machine, "quality built," designed for speed, reasonable first cost and low maintenance.



THE selective gear shift patented and used exclusively on Moore Speedcranes "Made in Manitowoc" is the basis of simplicity. No square jaw clutches, no cumbersome gear arrangements, no needless friction; all travel and boom hoist gears encased and running in oil. The entire mechanism is radically simplified — so accessible that any part, and they are of oversize dimension, may be removed without disturbing other parts.

The sixteen gear arrangement is but one of many reasons WHY the Moore Speedcrane, Shovel, Trenchoe, and Dragline is so popular. Repeat orders indelibly prove this. Investigate — then let the outcome form your opinion.



MANITOWOC ENGINEERING WORKS, *Manitowoc, Wis.*

(Sole Licensee to manufacture and sell Moore Speedcranes and Shovels)

Chicago Agents: MOORE SPEEDCRANE CO., 2916 W. 26th Street

Eastern Sales Agents: FORSYTHE BROS., 30 Church Street, New York, N. Y.

SPEEDCRANE

MOORE • MANITOWOC

SHOVEL — CRANE — TRENCHOE — DRAGLINE

One of a fleet of 22 White Trucks in The Service of The W. A. Ross Construction Company

Fleet of 22 White Trucks Speed Up Ready Mixed Concrete Operation

A FLEET of 22 White 2½-ton trucks, equipped with special power-dumping bodies, transported approximately 100,000 cubic yards of ready mixed concrete for The W. A. Ross Construction Company, of Kansas City during 1928.

The fleet of Whites has made it possible for the ready mixed concrete plant to increase production greatly and to extend its radius of distribution a distance of 10 miles. In order to keep pace with the large plant the Whites run continuously a minimum of 16 hours a day.

To operate successfully a central ready mixed concrete plant it is necessary that the supporting truck equipment be thoroughly dependable. Because of their ability to maintain rigid schedules the sturdy Whites have contributed in large measure to the success of the Ross Ready Mixed Concrete operation.

In all phases of construction work White Trucks have proved their efficiency and their ability to reduce costs. The White Truck line is the most complete in the industry—a model to meet the requirements of every transportation need.

THE WHITE COMPANY, *Cleveland*

WHITE TRUCKS
and WHITE BUSSES

It's the Super-Charger of the Thor SIX AIR COMPRESSOR That Gives You More Air

The THOR Creates a New Standard of Compressor Efficiency and Performance

In buying a Compressor, the most important feature to you is the amount of "air delivered." For it is NOT the "CAPACITY" or "RATING" of a Compressor that interests you, BUT THE AMOUNT OF AIR "ACTUALLY DELIVERED." "Capacity" or "rating" merely indicates the size of a Compressor and NOT the amount of air it delivers.

Because of clearance loss, valve slippage, etc., no Compressor EVER DELIVERS AN AMOUNT OF FREE AIR EQUAL TO ITS DISPLACEMENT. *And this is why the THOR SIX has a Super-Charger.* The Super-Charger was invented to counter-act these losses. It is an exclusive, patented feature that enables the piston on its IDLE or downward stroke to compress the additional air necessary to make up for the usual losses in single-acting Compressors.

You not only get more air with a THOR but you also get a Compressor that is designed along modern engineering principles. The THOR is direct-driven, both engine and Compressor being mounted on one crankcase, using a one-piece heavy drop-forged cast-steel frame that does away with useless weight and minimizes vibration, insuring longer life.

The THOR SIX inaugurates a NEW STANDARD of Compressor efficiency and performance. On the basis of "more air for your money," it deserves an investigation on your part. Get all the facts before you buy. Compare results—check performance—consider the saving you make in buying a THOR—and then decide. Your request will bring complete information immediately.

Thor Paving Breakers. The re-coil or kick-back has been eliminated. Do not freeze in severe weather. New steel retainer prevents steel from dropping out of nozzle. Made in two sizes

Thor Compressors are available in two sizes and in a variety of mountings. The 116-cubic foot rated unit actually delivers 96 cubic feet of air per minute and the 250-cubic foot rated size, actually delivers 210 cubic feet of air per minute.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS

GENERAL OFFICES
248 So. Jefferson St.
CHICAGO

ELECTRIC TOOLS

CLYDE HOISTS · DERRICKS

Always on the job —

No shirking or loafing where there's a Clyde hoist to set the pace. Whether for intermittent or for continious runs - Clyde hoists handles big jobs or small ones the same - Efficiently and Rapidly

Below is shown a sketch of the one and a quarter million dollar city hall at Atlanta, Ga. now being built by the National Const. Company of Atlanta. On this job, a Clyde double drum gas hoist handled a 14 foot concrete bucket in tower hoisting 3000 yds. of concrete, as well as 10,000 tons of materials such as Terra Cotta - Stone - Tile - Brick - Plaster - Steel - Forms - etc.

CLYDE

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CLYDE TWO MARKS OF GUARANTEED QUALITY SUCCESSFUL PERFORMANCE

Turntables Save Time and Trucks

WHEN job conditions are such that difficulty is encountered in turning supply trucks and keeping the paver busy—*the answer is a husky and dependable Blaw-Knox TRUCK TURNTABLE.*

One man turns the loaded truck—quickly. The backing distance to the paver is reduced to a minimum and the whole job is speeded up.

¾-ton to 5-ton capacities. A catalog descriptive of Blaw-Knox TURNTABLES will be sent upon request.

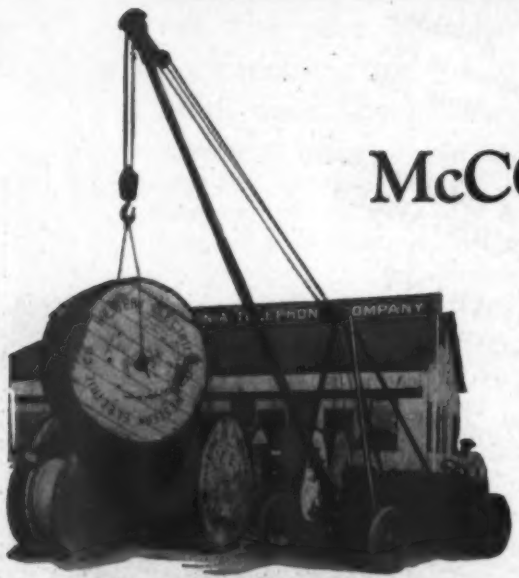
BLAW-KNOX COMPANY
667 FARMERS BANK BUILDING
PITTSBURGH, PA.

New York Chicago Buffalo Cleveland Baltimore
Philadelphia Birmingham Detroit Boston San Francisco
"Sales and Service Throughout the United States"

BLAW-KNOX

See that your industrial equipment is powered by

McCORMICK-DEERING



Every builder of mobile equipment who puts a McCormick-Deering power plant into the outfit he sells you works closely with International Harvester. Whether his product be grader, shovel, backfiller, ditcher, hoist, loader, locomotive for rail use, motive power for trailers, or any one of a hundred other industrial power units—we confer with him on design and specifications. He builds to quality standards and takes quality power from the world's largest tractor builder, at prices kept extremely low by volume production.

Every owner of McCormick-Deering-powered equipment will benefit in the years to come through the great service organization maintained by International Harvester. Company-owned branches now stand guard at 172 points in the United States and Canada. These are supplemented by industrial tractor distributors in all large cities and by thousands of McCormick-Deering tractor dealers. Stocks of parts and repairs are on call at stategic locations. Service facilities approached by no other industrial tractor power are *at your service.*

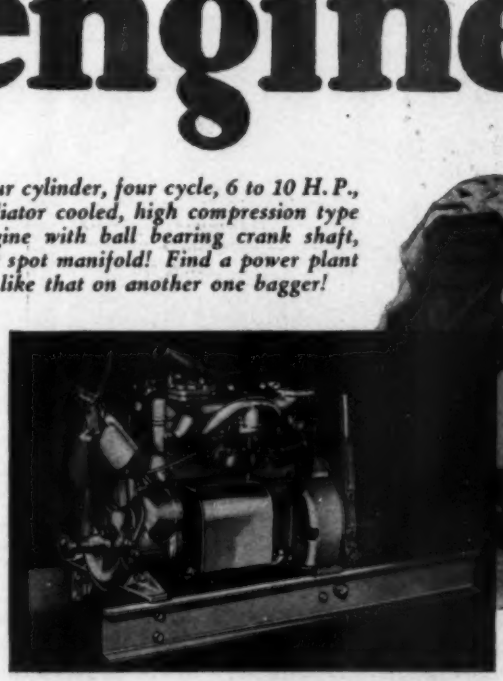
These are sound reasons for being sure that your mobile industrial equipment is powered by McCormick-Deering tractors built by International Harvester. We shall be glad to mail you the book "Tractor Power in Industry."

INTERNATIONAL HARVESTER COMPANY
OF AMERICA
(Incorporated)
606 So. Michigan Ave. Chicago, Illinois

McCORMICK-DEERING INDUSTRIAL TRACTORS

5-S Dandie with *4 cyl.* engine

Four cylinder, four cycle, 6 to 10 H. P., radiator cooled, high compression type engine with ball bearing crank shaft, hot spot manifold! Find a power plant like that on another one bagger!



FIND another mixer in the Dandie price range with all the outstanding features the Dandie gives you — worm gear drive on roller bearings in oil bath — high speed charging skip that needs no pounding — fast discharge that cuts off instantly—a rugged long distance performer! And now smooth four cylinder power! Write for Dandie Catalog.

Dandie Mixers: 5-S, 7-S, 10-S

5-S single or four cylinder, 7-S two or four cylinder, 10-S four cylinder gasoline engine. Charging skip or low charging hopper and platform. Rubber tired or steel rimmed wheels. Comply with A. G. C. standards.

KOEHRING

DANDIE

KOEHRING COMPANY MILWAUKEE, WISCONSIN

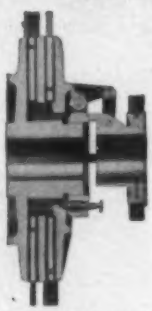
PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

Sales Offices and Service Warehouses in all principal cities

Foreign Department, Room 579, 50 Church Street, New York City

A5361-I

Do you mention the CONTRACTORS AND ENGINEERS MONTHLY when writing? Please do.



The Clutch of Many Uses

WHILE clutches of one kind or another have been used for centuries, no clutch has ever been adapted to so many and such varied uses as the Twin Disc.

It controls the drive of machine tools used to build other machinery. It is a familiar sight in every industry that uses internal combustion engines. Its range of capacities extends from .3 to over 400 H.P. per 100 R.P.M. In every situation it performs dependably because every installation is carefully engineered.

As further evidence of adaptability we are permitted to show the above installation of a Twin Disc power take-off in a 25-Ton Ohio locomotive crane. Through it, the power of a Climax R-6-U engine is applied dependably to every purpose required in the operation of a traveling crane.

You incur no obligation when you ask questions about the Twin Disc clutch. Write.

PARTS STATIONS

Boston, Mass.—Rapp-Huckins Co. Inc., 59 Haverhill St.
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Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn. Ave.
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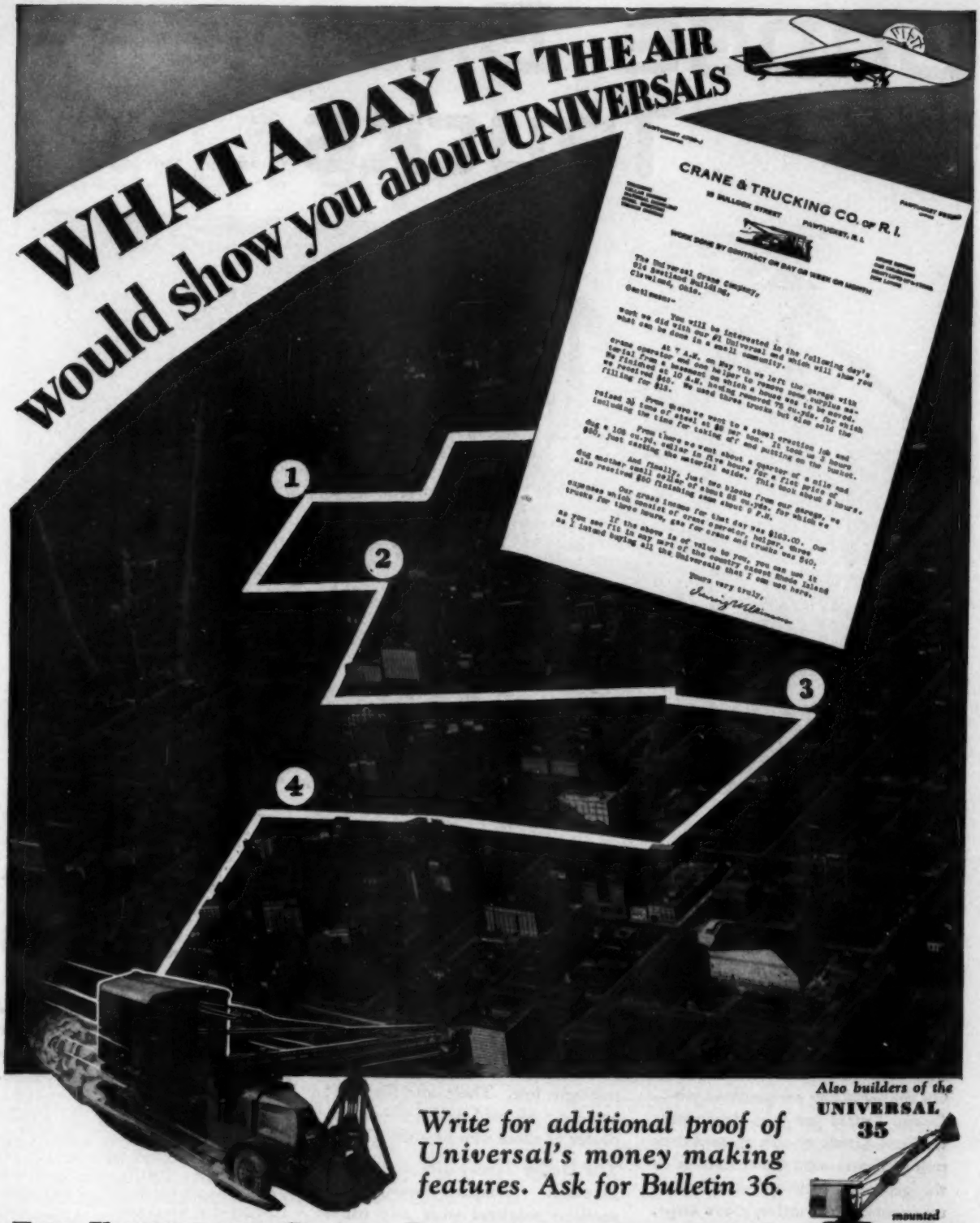
TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

WHAT A DAY IN THE AIR would show you about UNIVERSALS


CRANE & TRUCKING CO. OF R. I.
18 HILLSIDE STREET PAWTUCKET, R. I.
The Universal Crane Company,
914 Guardian Building,
Cleveland, Ohio.
Gentlemen:-
You will be interested in the following day's work we did with our #1 Universal and which will show you what can be done in a small community.
At 7 A.M. on May 7th we left the garage with our operator and one helper to remove some surplus material from a basement on which a house was to be erected. We finished at 10 A.M., hooking, removing to dump, and returning for $15. We used three trucks but also sold the filling for $15.
From there we went to a steel erection job and raised 3½ tons of steel at $6 per hour. It took us 2 hours, including the time for taking off and putting on the hooks.
From there we went about a quarter of a mile and dug a 10ft sq. cellar in five hours for a flat price of $60, just counting the material sales. This took about 8 hours.
And finally, just two blocks from our garage, we dug another small cellar of about 22 cu.yds. for which we also received $60 finishing same about 6 P.M.
Our gross income for that day was $163.00. Our expenses on job consist of crane operator, helper, three trucks for three hours, gas for crane and trucks was $40.
If the above is of value to you, you can use it as you see fit in any part of the country except Rhode Island as I intend buying all the Universals that I can use here.
Yours very truly,
1
2
3
4

Write for additional proof of Universal's money making features. Ask for Bulletin 36.

Also builders of the **UNIVERSAL 35**

mounted on the Center Drive Crawler

THE UNIVERSAL CRANE COMPANY · *Lorain, Ohio*

UNIVERSAL

DODGE BROTHERS TRUCKS

CHRYSLER MOTORS PRODUCT

Workers on the job, money-savers on the cost sheets . . . Dodge Trucks

You can put a Dodge Truck to work on any job. It will save money for you—earn money for you. Thousands of contractors will tell you so.

On the job—any construction job—Dodge Trucks are safe, dependable workers. Grade or soft ground they pull with sureness. Open road or in the get-away, their speed and pick-up insure more miles, more trips, more material hauled.

On the cost sheets—of any contractor they serve—Dodge Trucks show records hard to better . . . In operation and in upkeep, their cost is surprisingly low. Their low first cost and long life add still more to the profits of those who own them.

Test Dodge Trucks with your needs in mind. Compare these rugged, modern workers with any other truck, no matter what its price. Go over the complete line with your Dodge Brothers Dealer. He can deliver the correct chassis, with body, ready for your service.

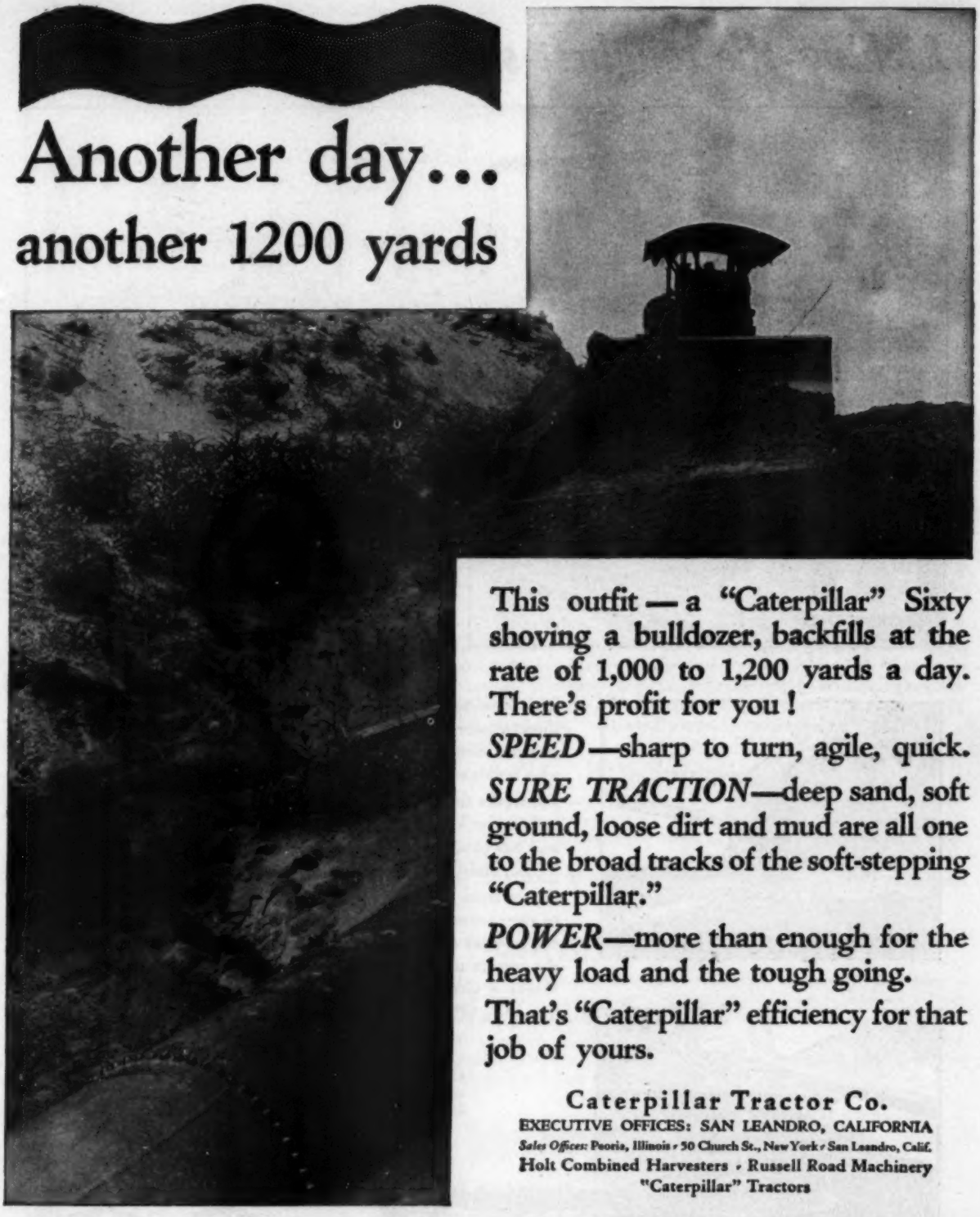
PRICES

MERCHANTS EXPRESS—102" w. b.	$ 545
COMMERCIAL TRUCK—120" w. b.	775
1-TON—130" wheelbase	995
1-TON—140" wheelbase	1065
1½-TON—150" wheelbase	1345
1½-TON—165" wheelbase	1415
2-TON—150" wheelbase	1515
2-TON—165" wheelbase	1585
3-TON—135" wheelbase	1745
3-TON—165" wheelbase	1775
3-TON—185" wheelbase	1845

Chassis f. o. b. Detroit

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

Another day... another 1200 yards



This outfit — a "Caterpillar" Sixty shoving a bulldozer, backfills at the rate of 1,000 to 1,200 yards a day. There's profit for you!

SPEED—sharp to turn, agile, quick.

SURE TRACTION—deep sand, soft ground, loose dirt and mud are all one to the broad tracks of the soft-stepping "Caterpillar."

POWER—more than enough for the heavy load and the tough going.

That's "Caterpillar" efficiency for that job of yours.

Caterpillar Tractor Co.
EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA
Sales Offices: Peoria, Illinois • 50 Church St., New York • San Leandro, Calif.
Holt Combined Harvesters • Russell Road Machinery
"Caterpillar" Tractors

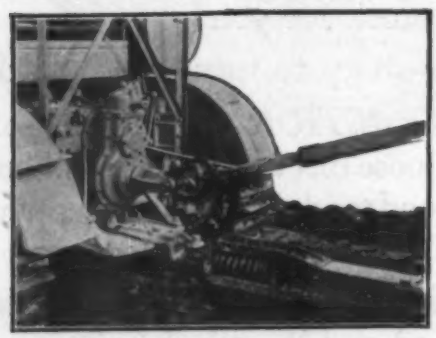
Prices—f. o. b. Peoria, Illinois

TEN	$1125	TWENTY	$1975
FIFTEEN	$1500	THIRTY	$2475
	SIXTY $4300		

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR

Licking the toughest soil in the United States

It's the *NEW* Power Take-off Russell



This issue announces the new Russell Sixty Elevating Grader with direct power take-off from a "Caterpillar" Sixty—and that means cheaper costs for every contractor who moves earth—every man who builds roads.

For weeks this new Russell has been ripping through the toughest soil in the United States, the "buck-shot" of Arkansas' Levees—and has proved its mettle. Lowrance Bros., Contractors, Memphis, Tenn., attest its remarkable performance.

Direct from the "Caterpillar" Sixty through anti-friction bearings to the carrier goes the power—(No bull wheel mechanism). Under the severest test to which an elevating grader could possibly be put, the results are—Lighter Draft • Greater Capacity • Conserved Power • Greater Mobility • Greater Economy • Cheaper Earth.

There's a "Caterpillar" Dealer near you.

Caterpillar Tractor Co.
EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA
Sales Offices: Peoria, Illinois • 50 Church St., New York • San Leandro, Calif.
Holt Combined Harvesters • Russell Road Machinery
"Caterpillar" Tractors

RUSSELL
Better Built
Road Equipment

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR

THE TWO BIG NAMES IN EARTH MOVING

Above corings were taken from un-cured concrete base for black-top.

Hunt Process "Cure Prevents Hair-Checks Gives Greater Strength

THE "Hunt Process" hastens the completion of the job—opens the road earlier—prevents destructive hair-checks. But even more important, it makes the concrete actually stronger through proper curing. These are accepted facts, proven by the use of millions of yards of "Hunt Process"-cured pavement over a period of years.

8½% Stronger

Through a series of corings, made in widely separated parts of the country, it was conclusively proven that the "Hunt Process" makes concrete 8½% stronger than that cured by dirt and water. These corings were taken from actual pavements laid in climates varying from the hot, dry desert to freezing mountain temperatures.

Ideal for Black-Top Pavements

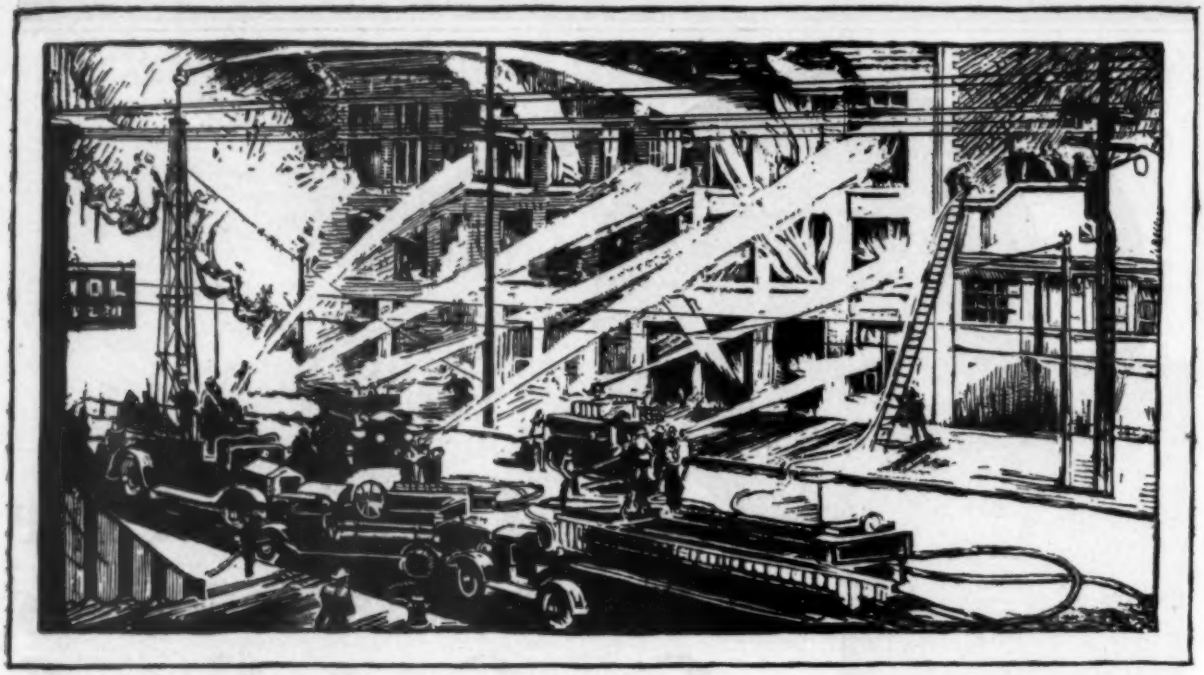
Concrete base when used in connection with black-top pavements is usually a weaker concrete and as a rule is very seldom cured properly. The badly hair-checked cores shown above were taken from such concrete. The "Hunt Process" not only cures concrete base perfectly, eliminating all hair checks, but acts as a perfect binder for the black-top as well.

MacEVERLAST, INC.

111 West Seventh St. Los Angeles, Calif.

35 E. Wacker Drive, Chicago, Ill. | 1754 Graybar Bldg., New York, N. Y. | 1314 Magnolia Bldg., Dallas, Texas

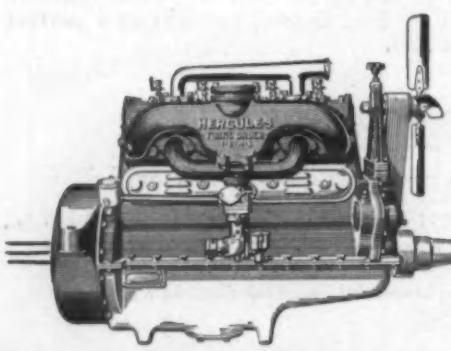
Offices in:—Kansas City, St. Louis, Phoenix, Pueblo, Seattle, Honolulu, San Francisco, El Paso, Oklahoma City.



Pumping 500 gallons per minute *for* Fire Fighting streams

Fire-hose quickly connected to hydrant . . . the Hercules equipped Seagrave Suburbanite Pumper throbbing powerfully . . . and into the blazing building is poured a quenching flood of water at the rate of 500 gallons per minute!

In providing power for pumping high pressure fire fighting streams Hercules dependability is never more dramatically proved. In other fields, Hercules sets just as high a standard of performance—furnishing heavy-duty power for varied types of industrial and oil-producing machinery and automotive equipment.



Well-known manufacturers of pumping outfits have standardized on Hercules.

HERCULES MOTORS CORPORATION
CANTON, OHIO, U. S. A.
West Coast Branch: Los Angeles, Cal.

HERCULES ENGINES

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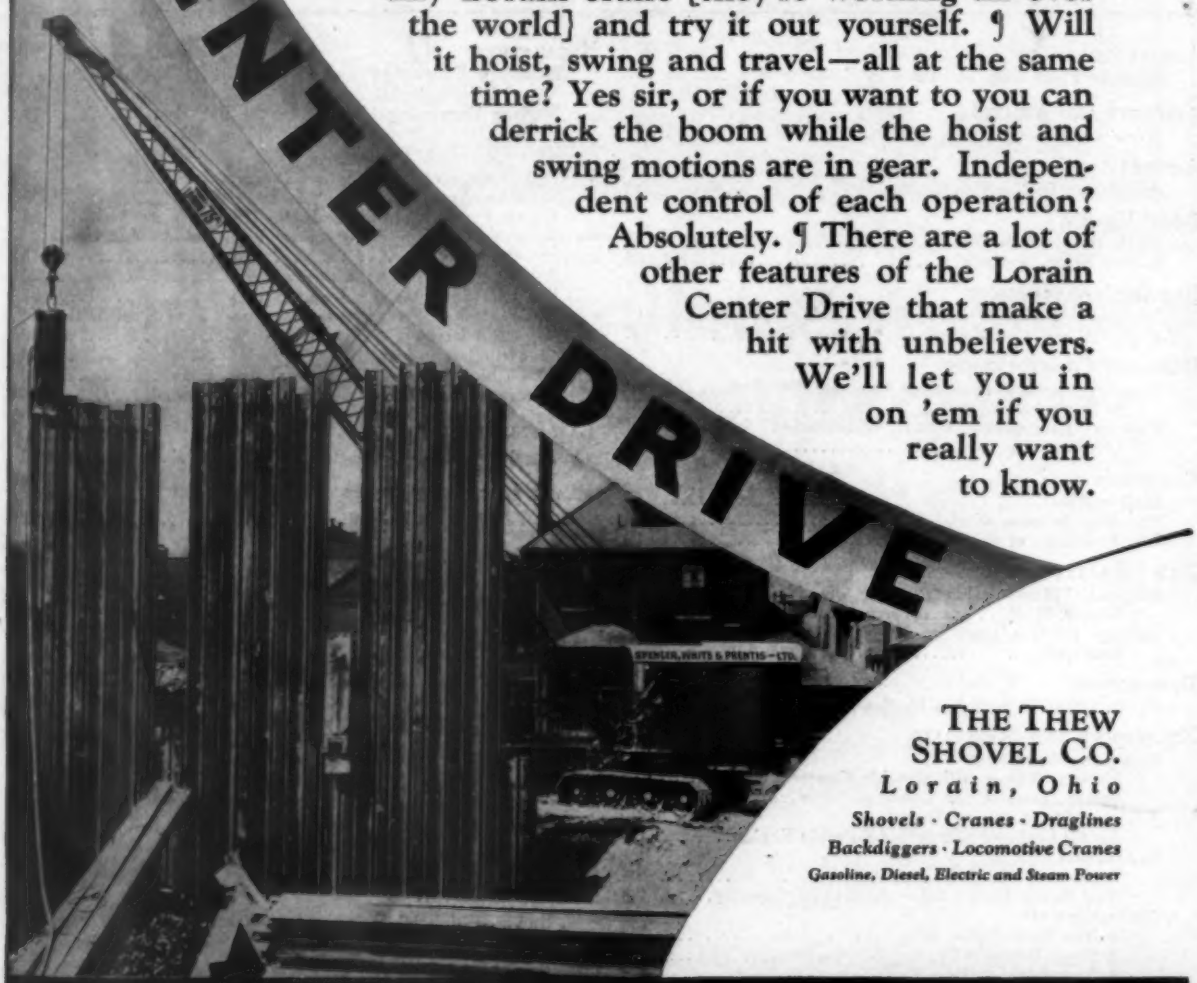
LORAIN 55-60-75

THEW CENTER DRIVE

MEET up with the 1¼ yard Center Drive Crane driving steel piling on the Detroit-Canada Vehicular Tunnel. It's built by Thew and named the Lorain 75. That's about all that you need to look for to know the crane is just about 99% plus. ¶ But if there is any doubt in your mind, step into the cab of any Lorain crane [they're working all over the world] and try it out yourself. ¶ Will it hoist, swing and travel—all at the same time? Yes sir, or if you want to you can derrick the boom while the hoist and swing motions are in gear. Independent control of each operation? Absolutely. ¶ There are a lot of other features of the Lorain Center Drive that make a hit with unbelievers. We'll let you in on 'em if you really want to know.

CENTER DRIVE



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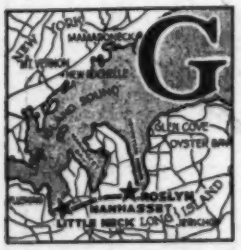
Vol. XIX
No. 1

Contractors and Engineers Monthly

July,
1929

A Close Check on Costs

With Graphs Showing Daily Production and Costs on Well-managed Job of C. H. Earle, Inc. Using Two Mixers and Crews



GRAPHS showing the daily accumulated costs of labor, both direct and indirect, the yards of concrete produced by each mixer each day, with notes indicating reasons for unusually short runs and losses of time, as well as a chart showing the path of each mixer over its respective strips throughout the course of the job, are maintained by C. H. Earle, Inc., on its 4.33-mile reinforced concrete paving job on the North Hempstead Turnpike, Long Island, N. Y., between Little Neck and Roslyn, near the north shore of the Island.

Design

This project is a 4-strip reinforced concrete pavement, the strips being 10 feet wide, 9 inches uniform thickness, with ¾-inch Elastite expansion joint laid at intervals of 78½ feet. The right-of-way was purchased for a 60-foot roadway, and all bridges and culverts have been built for the future widening operations.

Grading

The coarse grading was done entirely by three Bucyrus-Erie steam shovels and one Northwest gas shovel. This consisted of about 109,000 yards of unclassified excavation, which was slightly in excess of the required fill so that some of the material had to be wasted. There was no borrow on the job. A portion of the excavation was through a stretch of old Telford base, which was so well compacted that it was necessary to excavate about one foot below the base to remove the hand-laid material. This extra depth below grade had to be refilled and rolled.

Aggregate and Cement Delivered by Barge

The unloading and batching plant is located about 1¼ miles from the center of the job in Great Neck on the west shore of Manhasset Bay. Stone is delivered by barge from the quarries of the New York Trap Rock Co., on the Hudson River, direct to the wharf at the unloading plant. An Ohio locomotive crane running along the edge of the wharf handles the delivery of the stone to two storage piles or to the batcher direct as required. The stone storage piles are located at the outside of the aggregate area, with two duplicate 75-ton Blaw-Knox batchers next and the sand pit in the center. Sand is delivered from a local commercial pit by trucks of the Earle Transportation Co., an allied corporation of the paving contractor. The same trucking company handles the hauling of batches to the pavers with a fleet of 20 Mack trucks, and also has 10 additional on grading operations. All of the trucks are equipped with Goodrich pneumatic tires, and the batch trucks haul 3 seven-bag batches per load.

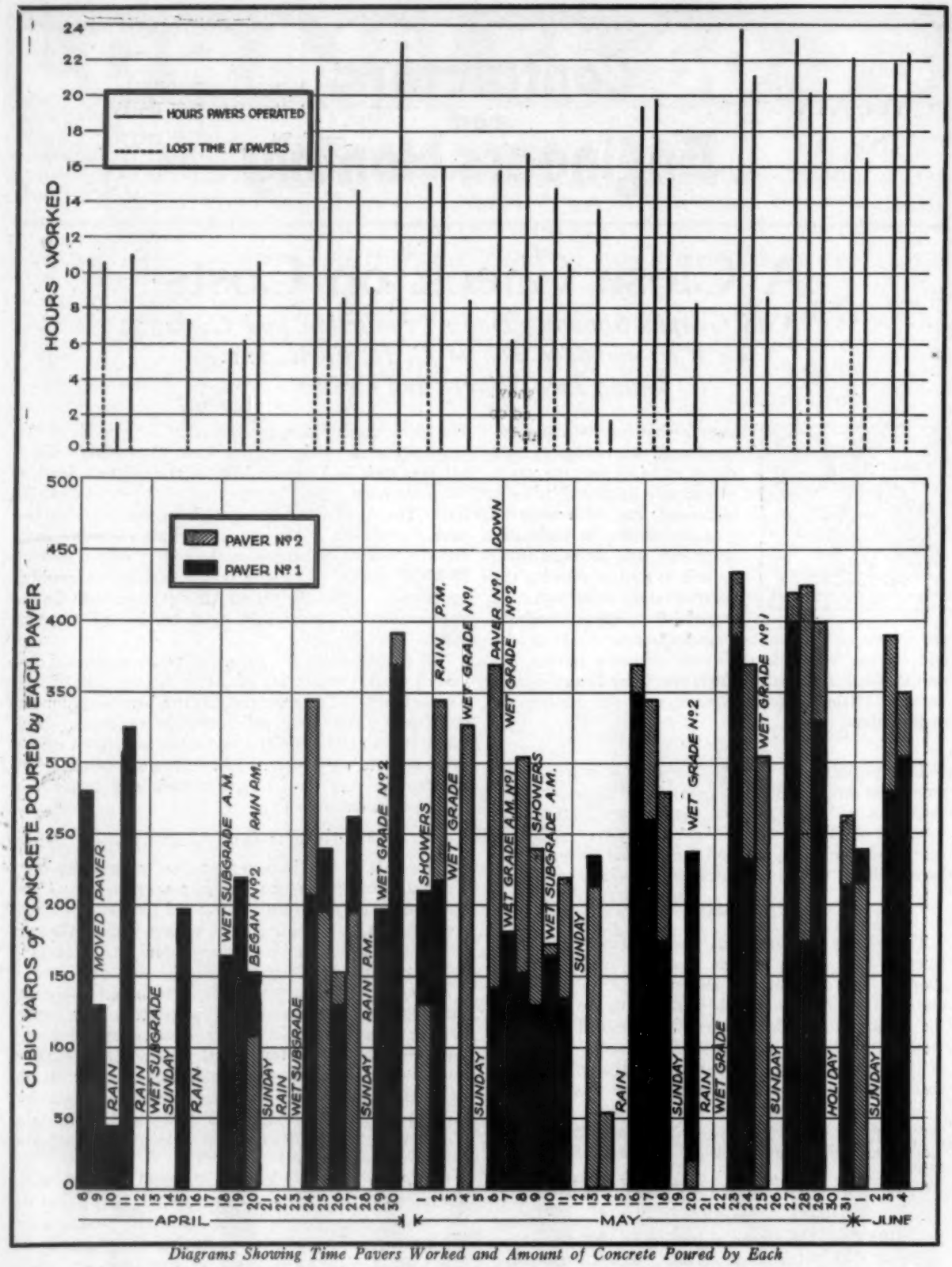
The cement from the Edison plant is purchased delivered to the contractor's wharf by lighter loads of 10,000 bags each. The lighter unloads to a platform running out from a 6,000-bag galvanized iron cement shed, which has a platform along two other sides for loading the bags into the trucks. Ten men work regularly in the cement shed, and teams of two men throw the opened bags on the load of batches.

Fine Grading and Form Setting

The job is divided into two practically equal sections, which are worked as two complete organizations from fine grading through form setting and concreting. Each crew has a Good Roads grader, with a built-in Cletrac tractor for power for fine grading, and the same machines were used later on finishing the shoulder.

Some difficulty was experienced with wet subgrade which delayed fine grading and form setting to a minor degree. Four men make up the separate crews for setting the Heltzel steel forms with 2½-inch tops. After the forms are set accurately and the subgrade tested with a scratch-board or template, a subgrader made by the Atlantic Engineering Co., is used to bring the subgrade true to line. After this it is rolled with a 5-ton Buffalo gasoline roller.

One or two men are kept on the final subgrade with a scratch board about one block or 78½ feet ahead of the mixer. The scratch boards used were designed by the Superintendent, Henry Westdyke. They consist of 2 x 12-inch planks cut about 12 feet long, and then trimmed so that the top will form a handle on each side of the form, and the bottom will be about 2½ inches from the final grade. To the bottom of the plank is bolted a strip of ⅝-inch iron, in which are bored ¼-inch holes every 4 inches. Screws with the heads cut off



Diagrams Showing Time Pavers Worked and Amount of Concrete Poured by Each

and pointed are screwed into the wood through these holes until the points are at the required distance from the face of the board to give a scratch when the subgr[illegible]too high. When the points wear the screws are simply screwed out the required amount. The board runs on the forms on steel skids to prevent wear on the wooden handles which protrude out over the forms. The scratch board is pulled along by hand, using a rope

rigged through screw eyes in the board, as shown in the illustration.

CONCRETING CREWS

Each concreting crew consists of the mixer operator, 4 men shoveling behind the mixer, 2 men spading along the forms, 2 men in front of the Ord finishing machine keeping a sufficient amount of concrete at the face of the screed, and also placing the National Steel Fabric welded reinforcing mats measuring 9 feet 6 inches x 14 feet, 1 man setting the Elastite expansion joint using a ⅜-inch steel plate as a bulkhead and a channel cap with two flanges about 2 inches deep. Two men empty the cement from the bags into the skip of the paver.

The mixers are fitted with a Y and two valves for the hose connection so that the mixer is never without a water connection. As one hose is about reaching its limit the next length is attached to the second branch of the Y from the next tap on the water line and the old one shut off only when the new connection is completed and open, thus the mixer is never in a position where it cannot get water for a batch at any instant.

Another detail that is particularly interesting and which demonstrated its usefulness in a manner not originally planned, is to equip the mixer hose with a branch connection about 50 feet from the Y. At this branch an ordinary garden hose is connected for wetting down the subgrade, thus eliminating the need for a second hose running along the subgrade ahead of the mixer. When this job was visited, an inquisitive errand boy stepped on the strip of concrete next the strip that was curing with the hay cover and was watching the mixer "wheels go around." He lighted a cigarette and carelessly flipped the still-lighted match over onto the hay which immediately caught fire and spread rapidly. A call from the mixer operator brought four men with shovels to beat it out and the man sprinkling the subgrade ran up with the light garden hose and put out the flames in an instant.

Not quite so fast was the laborer who a few minutes before saw a light delivery truck belonging to a local butcher start to cross the 4-hour-old concrete a few hundred feet behind the mixer. When the truck started to get away recrossing the concrete he threw a railroad tie across the road and the truck again ran onto the fresh concrete. The laborer fearful lest he be run down did not stop running long enough to catch the license number on the butcher's truck.

The first strike-off of the concrete is made 2 inches below the final grade so that the fabric reinforcing can be laid on the concrete. This strike-off is done by hand to give the finishing machine more time on screeding and to reduce the number of times the machine must pass over the forms.

REMARKABLE ACCOUNTING RECORDS KEPT

A checker under the foremen of the mixer crews and a special man at the unloading yard keep accurate records so that at any time an examination of the data on hand quickly shows the exact status of the job. The checkers at the mixers keep a record of the time each block or 78½-foot strip of pavement is started and ended and the exact number of batches mixed and emptied into the area. Thus it is quickly possible to note whether through some error of the subgrade crew the grade is running low and more concrete is being placed than should be required for that length of pavement. These men also check the time each truck leaves the mixer and the man at the yard similarly checks the time each truck leaves that point with its load. Thus each truck is accounted for at all times during the day and its number of batches hauled is known.

Each night the lengths of pavement laid by each mixer are plotted by the engineer for the contractor on K & E profile paper and also on another record the number of cubic yards of pavement mixed by each paver is plotted. This record for the period from the beginning of paving this year to June 3 is reproduced with this article. The record shows the causes of small production, but good organization and fine spirit among the men is the reason for the four or five days when the production went over 400 cubic yards for each mixer in one 12-hour day. The preceding and succeeding days were not short days in which special preparations were made for records, but were good figures running well up to 375 and 385 cubic yards in most cases.

The best day's work recorded was on May 23 when together the two mixers turned out 826.4 cubic yards of 1:2:3-½ concrete in 7-bag batches. Mixer No. 1 poured 1,413 feet of 10-foot strip 9 inches thick starting at 6:25 A.M. and running until 6:56 P.M. with 7 minutes lost time and 30 minutes out for lunch. In this time 406 batches of concrete were produced. Mixer No. 2 started at 6:15 A.M. and quit at 6:25 P.M. with 32 minutes lost time and 30 minutes out for lunch. This mixer produced 446 batches.

DRAINAGE STRUCTURES

In addition to the grading and paving operations there were a large number of box culverts and drains that had to be completed before the actual paving could be started. There was one 8 x 5-foot reinforced concrete culvert measuring 124 feet in length including the wing walls, another 6 x 6 culvert, 143 feet long and a 7 x 8 culvert 142 feet long. In order to properly build this last culvert on a firm foundation it was necessary to drain a good sized pond and provide a sluice-way to care for the water during construction. On this same culvert, as well as with all on this job where traffic had to be maintained on the right of way at all times, the culvert was built one end, then the other and last the center portion.

Other drainage work on this job included several small reinforced concrete culverts, several 24 and 30-inch concrete pipe culverts, a storm drain for Little Neck in which 752 feet of 48-inch reinforced concrete pipe with slip joints was used, and over one mile of 24 and 30-inch reinforced concrete storm drain scattered over the job. A number of catch basins were built during the spring of 1929 and most of the drains were built in the winter. These included some French drains of broken stone.

DIFFICULTIES

Both the State and the contractor met with a number of troubles on this job as is usual with most highway work. The State experienced considerable trouble in securing the right of way in time for the contractor to start work promptly on all parts of the job but this has not delayed the progress materially due to the organization of the contractor. The contractor had to

EQUIPMENT AND PERSONNEL ON THE C. H. EARLE, INC., 4.33-MILE CONCRETE ROAD JOB ON NORTH HEMPSTEAD TURNPIKE, LONG ISLAND, N. Y.

1. The unloading and batching plant on Manhasset Bay showing stone barges and cement lighter at left, Ohio locomotive crane in center, and two Blaw-Knox 75-ton bins with batchers between stone piles and sand pit. Platform in foreground leads to cement house. 2. Buffalo-Springfield 5-ton gas roller hauling the Atlantic subgrader. 3. Close-up of the Atlantic subgrader. 4. The scratch-board designed by Henry Westdyke, Supt., C. H. Earle, Inc., showing the method of attaching hauling rope. 5. C. H. Earle, Pres., C. H. Earle, Inc., J. W. Davis, Engineer in charge for New York State Department of Public Works, and Henry Westdyke, Supt., C. H. Earle, Inc 6. Elastite expansion joints with dowels covered with tin sleeves to permit expansion without spalling the concrete. 7. Y-connection at the side of the paver to permit constant water supply even when shifting hose. 8. Valve on hose line 50 feet from paver to permit sprinkling subgrade ahead of paver. 9. Multi-Foote 27-E paver, with Mack truck delivering a batch. The chap in the lower left hand corner was responsible for the fire mentioned in the text. 10. The Ord finisher working on the top course.

maintain traffic over almost the entire length of the job at all times which made considerable planning necessary to keep traffic going and not interfering with the grading and concreting operations.

Public utilities were causes of more than their share of grief and as late as June 4 telephone conduits which should have been lowered to come within the new grade had not been touched, thereby threatening a delay in final grading and concreting or at least making it necessary to omit certain sections and return to them for concreting later which added to the contractor's expense.

New water mains were laid by two water companies the entire length of the job, as well as new gas mains, and all poles carrying electric wires had to be moved back on both sides of the right of way, and there were thousands of feet of cross connections for gas and water services that were made during the winter and not backfilled solidly which caused considerable trouble when the heavy equipment began to move over the job in the spring.

GUTTERS AND GUARD RAILS

About 9,000 square yards of concrete gutter were included in the concrete and were poured with the 27-E Multi-Foote paver used on one end of the job. This gutter is 5 feet wide throughout.

Standard cable guard railing with concrete posts and 3-strand, 7 wires to the strand, double galvanized steel wire cable of ¾-inch diameter, was erected at all points of danger on fill.

UNIT BID PRICES

The total bid of C. H. Earle, Inc., on this project R.C. 1764, C.H. 9018, was in the neighborhood of $500,000, including drainage structures and paving. The unit prices as furnished by the contractor are:

Clearing and Grubbing	$1,500
Excavation, unclassified	35¢ per cu.yd.
Wet excavation	$1.00 per cu.yd.
Pipe underdrain	30¢ per foot
Trimming shoulder	10¢ per foot
Preparing fine grade	15¢ per cu.yd.
Relaying old pipe	25¢ per foot
Timber	$70.00 per 1000BM
Cast iron pipe, 18", laid	$4.00 per foot
" " " 24" "	$6.50 per foot
" " " 30" "	$10.00 per foot
Reinforced concrete pipe, 18", laid	$2.30 per foot
" " " 24" "	$3.50 per foot
" " " 30" "	$5.50 per foot
" " " 48" "	$11.00 per foot
Portland cement	$2.20 per bbl.
1:2:3 ½ concrete	$17.00 per cu.yd.
1:2:4 concrete	$15.00 per cu.yd.
1:2 ½:5 concrete for retaining walls	$14.00 per cu.yd.
Metal reinforcing, mesh	30¢ per sq. yd.
Bar reinforcing, dowels	10¢ per lb.
Fabric reinforcement for culverts	18¢ per sq. yd.
Bar reinforcement for structures	6¢ per lb.
Miscellaneous iron and steel	8¢ per lb.
Cable guard rail	75¢ per foot
Concrete guard posts	$2.75 each
Broken stone, 2½-inch, bottom course, bit. mac	$6.00 per cu.yd.
" " 1½-inch, top course, bit. mac	$8.00 per cu.yd.
1:2:3½ concrete pavement	$7.35 per cu.yd.
Bituminous material A, penetration method	14¢ per gal.
Maintaining traffic, per foot per strip	5¢ per foot
Maintaining traffic at three culverts, large	$150 each
Piles, wood	90¢ per foot
Broken stone, from ¾- to 1½-inch	$4.75 per cu.yd.
Concrete gutter	$1.25 per sq. yd.
Cobble gutter	$1.00 per sq. yd.
Catch basins, concrete	$60.00 each
Changing elevation, catch basins and manholes	$10.00 each
Concrete right of way markers	$2.75 each

PERSONNEL

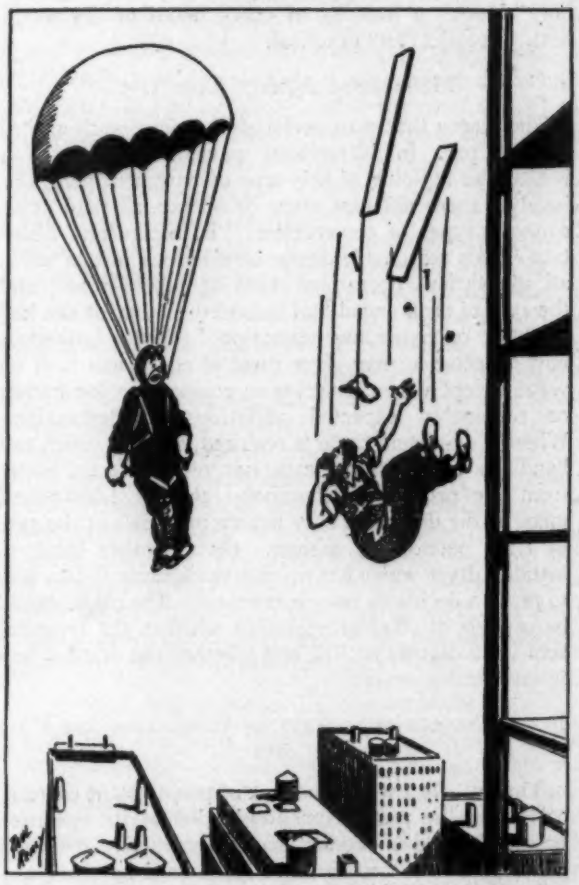
This contract was let by the New York State Department of Public Works, Frederick S. Greene, Superintendent, and has been carried on under the jurisdiction of James S. Bixby, District Engineer, and J. J. Darcy, Resident Engineer, with J. W. Davis as Engineer in Charge. The contractor is C. H. Earle, Inc., Rockville Centre, L. I., N. Y., C. H. Earle, President, and Harry Westdyke, Superintendent, with H. F. Hartman as engineer.

Our Front Cover Illustration

WE are indebted to *The Explosives Engineer* for the interesting illustration by W. D. White, which appears on the front cover of this issue of CONTRACTORS AND ENGINEERS MONTHLY. In a recent issue of *The Explosives Engineer* four of these sketches were presented under the title "The Stone Age Returns," with the statement, "As man's utilization of materials for construction developed through the centuries he fashioned structures with the aid of clay, hewn stone, wood, brick, iron, steel and, lastly, cement. These four sketches by W. D. White reveal the application of drills and explosives in the production of stone for cement, aggregate, ballast and other useful purposes. The universal use of these products of the quarry proclaims the return, though modernized, of the stone age."

The first sketch shows a massive steam shovel loading an industrial crane with stone, the second a laborer with his jack hammer drill drilling large pieces of rock for further reduction by explosives into small enough stones for the power shovel to handle. The third sketch shows the stripping of overburden preparatory to drilling and blasting, while the fourth illustration is that which we have reproduced on our front cover.

"Mollycoddle!!!"



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Mix Gray Matter with Your Black Top

By T. Warren Allen

Chief, Division of Management, U. S. Bureau of Public Roads

THE most obvious thing about a bituminous paving job is the mixing plant with its accessories. The hot mix plant consists of equipment for getting the aggregate to the plant site, the drying and heating equipment, the screening and proportioning equipment and the mixer. The fitness of the equipment and the skill with which it is operated not as individual units, but as a coordinate whole, usually indicates long before the job is completed whether the contractor will be able to secure profits.

Anyone with plenty of cash or credit can secure an imposing array of equipment, but to choose or select such equipment as will form a sturdy, reliable plant of properly balanced capacity, one suited to the work it is to perform and one possible of efficient and economical operation, requires more than either plenty of cash or credit. It requires knowledge and experience gained only through a mastery of every detail of the work, both theoretical and practical.

Managerial Ability Essential

The reason that managerial ability plays such an important part in bituminous pavement construction is that the building of this type of pavement generally involves more different steps or operations than other common types of construction. To secure and maintain even a reasonable degree of efficiency in this work, all the various operations must be synchronized, and the rate of each gaged and balanced to that of the key producer or controlling operation. Greater individual unit capacity for any given piece of equipment is of no value except where it serves to compensate for known or reasonably expected variations or fluctuations. Where a 60-second cycle is required, a mixer which can handle a 3,000-pound batch per minute is no better from the production standpoint than a 1,500-pound mixer if the dryer can only handle materials at the rate of 1,500 pounds per minute. On the other hand, to install a dryer which has no reserve capacity is also sure to prove a decidedly poor investment. The plant should be capable of efficient operation whether the temperature is 50 degrees or 100, and whether the original materials are dry or wet.

Plant Coordination, Rate of Production and Unit Costs

The full effect which the lack of proper plant coordination and the proper synchronization of its operation has on the rate of production and consequently on unit costs, does not seem to be fully realized by most contractors. It is a fact that the daily or hourly operating costs of any average asphalt road building outfit is very nearly the same whether it is operating at its maximum rate of production or almost any conceivable point below its maximum. Consequently, if an outfit is operating at one-half of its possible rate, the operating and fixed overhead cost per unit of production is certain to be about twice as high as it should be. This is no small item. The hourly operating cost, which includes all labor, supplies, overhead and rental value of the equipment, is seldom less than $30 per hour, and for a large plant may be more than three times this figure. If the outfit is costing, for example, $50 an hour, and producing only 40 tons an hour, the operating cost is at the rate of $1.25 per ton. If the rate of production can be increased to 50 tons an hour, or 25 per cent, the operating cost has been reduced to about $1 a ton. In other words, the contractor has added the neat item of $12.50 per hour to the right side of his ledger, or about $125 per 10-hour day of actual operation.

Lack of Standardization in Asphalt Work

The first and most apparent characteristic noted on jobs which have been studied during the past year is the lack of standardization, both as to equipment and methods of operation. The plants regularly used in bituminous road construction range in sizes from as small as those capable of handling no more than a 700-pound batch to those handling a 4,000-pound batch. This is a tremendous range as compared with concrete paving work, where the 21-E and 27-E mixers are now used almost exclusively.

Methods of equipment for handling and heating the materials are, if possible, even more varied. Only in the hauling equipment is there considerable uniformity. Either heavy or medium weight trucks are used by the majority of the plants. The heavier trucks, in addition to their large carrying capacity, have a further advantage, in that they can be used in connection with large spreader boxes and thus eliminate a great deal of hand labor and shoveling. Light trucks do not have sufficient power to pull the heavy asphalt spreader boxes. The use of spreader boxes is not general. It is a labor-saving device worthy of practically universal adoption. They have not been brought to the state of perfection desirable, but, in addition to greater economy, they aid in securing greater uniformity in pavement stability, partially because they obviate the necessity of more than two or three men working and walking about in the paving mixture ahead of the finishing machine and minimize the effect of such walking, which causes greater consolidation in the parts walked upon.

The Use of Finishing Machines

The question of whether or not to use finishing machines such as are used on concrete road construction

has been discussed more or less academically. About a year ago the ordinary concrete finishing machine was tried out on asphalt work very successfully.

The use of a finishing machine has been almost equally successful on Topeka or bituminous concrete as on sheet asphalt. The forms must, of course, be set a little more carefully, but this need not entail any appreciable expense. The best solution is to use a standard steel form as in concrete road construction. Well developed equipment and trained labor would then be readily available for this work, as it could be drawn from either field. On work 20 feet or wider the speed of the concrete finishing machine is sufficient to care readily for a production of 60 to 70 tons per hour of 2-inch asphalt road construction. On two-lane construction, where the width is frequently only 9 or 10 feet per lane, the traveling speed of the finisher should be increased by the substitution of a better gear ratio. In cold weather a blow torch or other means is required to heat the screed before beginning work. After the torch is once hot, however, the material seems to supply sufficient heat to prevent sticking or picking up, providing the work is at all continuous.

The operation of the finishing machine on bituminous work is practically as simple as on concrete work. The spreading, whether by hand or by spreader boxes, should be high enough to provide a light ridge or roll of material in front of the strike-off at all times. It seems to be advisable to have the screed slightly higher at the toe than at the heel. A suitable and rapid means of adjusting the height of the screed should also be provided. In all cases studied the use of the finishing machine has made it possible to reduce the number of laborers. With more experience, it is believed that where suitable spreader boxes are used in connection with the finishing machine, it will be readily possible to reduce the present shovel and raking crew of 18 to 20 men to about 5 or 6 men, whose chief duty will be to keep a proper amount of material in front of the finishing machine and to tend the spreader boxes for the trucks. The perfection of spreader boxes will undoubtedly render all raking unnecessary.

MORE UNIFORM ROAD SURFACE PRODUCED BY FINISHING MACHINES

The greatest advantage to be expected from the use of the finishing machine is not perhaps so much a reduced labor cost as in the production of a more uniform and smoother road surface and the ability to handle a larger tonnage on the road. With the old method of hand spreading and raking this operation frequently places a definite limit on the amount of material to be placed per hour. This is especially true in hot weather, which is otherwise the best time to lay asphalt.

With the use of suitable spreader boxes and a finishing machine, properly adapted to this work, the only limit to the rate at which the material can be placed on the road will probably be the rate at which the rollers can do the necessary consolidation.

WHAT WEIGHT OF ROLLER?

The question as to the amount of rolling required, the size or weight of roller best adapted to this work, and last, but not least, the question of the rate and manner in which the consolidation takes place is important. Investigations made thus far point quite definitely to certain probable conclusions. Samples have been taken from the roadway after various passes of the roller, and these tested for both density and stability. The stability determinations and the rate at which the density increases with repeated rollings follow, roughly, a similar curve. Beginning with the sand asphalt material, which had a density of about 1.76 as it was spread and raked on the road, ready for the roller, the density increased very rapidly, but after four or five passes of the roller the increase for each additional rolling became very slight, which raises the question as to the point at which further rolling ceases to add sufficiently to the wearing and riding quality of the road surface to be worth while.

According to the studies made thus far, the rate of consolidation does not seem to be in proportion to the weight of the rollers. The density secured from the use of the 6-ton roller was practically the same as that from a 9-ton roller. This raises the further question as to the best weight of rollers for this kind of work, and also at which point the asphalt surface reaches sufficient stability to prevent displacement under traffic.

WHAT SLOWS UP PRODUCTION?

A study of a fairly typical job with a small plant and mixer capacity for handling a 750-pound batch with good hauling equipment and plant and other equipment which could be classed as fair, covered a period of 793 available working hours of which the job was actually working only 398 hours. A total of 395 hours, or practically one-half of this available time, was thus

The Business of Bituminous Paving

Bituminous pavement construction is a business. It requires a sufficient amount of capital, a proper plant, an efficient organization and managerial ability of high order if the business is to be successful. The construction of a bituminous pavement is essentially a manufacturing process, consisting largely of specified or approved methods and equipment, by means of which certain materials are assembled, treated, proportioned, combined, transported, placed, spread, consolidated and finished into a smooth and enduring road surface conforming in all respects to the requirements of the approved plans and specifications. The steps involved consist essentially of a connected series of consecutive operations, all of which must be completed in their established order within certain rather definite time limits or the contractor will find not only that his rate of production is low, but that the losses resulting from that rate may be increased by a loss of the cost of processing which has been given the material and if the processing has passed a certain stage, this loss may also include the materials as well.

laneous causes consumed the other 29 hours. Practically one-half the best portion of a contractor's working season was thus irretrievably lost so far as possible profitable operation was concerned.

AND STILL MORE TIME LOSSES

The above-mentioned losses were not the only time losses. More than one-fourth of the time, or 25.4 per cent of the total time, he was actually on the job with his full crew, was lost in minor interruptions and delays. Thus, a total of 10 per cent of the time he was out on the job was lost in waiting for hot material, 6 per cent was lost because of minor mechanical trouble, chiefly at the plant, 4.5 per cent was lost because of inadequate truck supply, the mixer operator added 2.1 per cent to the contractor's already sufficient burden, while 2.3 per cent of the time was due to the various causes.

The operating cost for this job was approximately $350 per day. Consequently, a loss of an average of 25.4 per cent of the working time represented a shrinkage in the contractor's possible profits of over $80 per day. Not all of these minor time losses can be eliminated, but we have yet to find a job with large time losses of this nature or, in other words, operating at a low rate of efficiency, on which it has not been possible to reduce materially the time losses, increase the rate of production and decrease the unit costs.

Safety Code Devised for Employees

THE following safety code has been devised at the Manitowoc Portland Cement plant for the employees:

THINGS I WILL REMEMBER

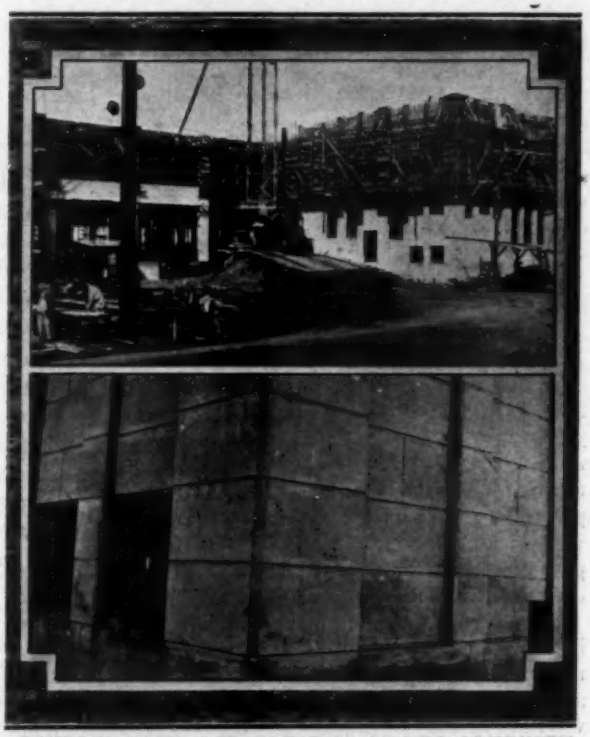
1. To report to the laboratory immediately any injury to myself.
2. To see that my fellow worker goes to the laboratory if he is injured.
3. To understand that the slightest scratch or bruise may mean lost time or even worse unless attended to.
4. To be careful around moving machinery, moving objects, and objects swinging on tackle or chain falls.
5. To keep my feet clear of heavy objects being lowered to the floor.
6. To never tamper with gears, belts and so forth, while machine is in motion.
7. To see that ladders are securely blocked before I use them, and scaffolds properly made,—no rotten or knotty boards or braces, and to inspect all slings, tackles and cable clips.
8. To protect my eyes from dust and sparks from cutting torches and the heat and glare from cutting and welding. Also the dust from emery wheels.
9. To lift properly and use my muscles as they should be used.
10. To ever watch my step and practice safety at my work, at my home, and on the street.
11. That my strict observance of these principles will enable my company's employees to maintain the highest possible standard of "Safety First" ethics.

Such a code, distributed among the employees and adopted by them, might help to lessen the ever-increasing number of accidents in the construction field. One of the difficulties which the safety man encounters is the fact that unless he can point out specific instances where certain practices have resulted in accidents, it is a difficult matter to have these hazards corrected.

The whole object of accident prevention is *accident prevention*, which means that every possible hazard must be done away with and every man on the job must do his work with the ideal of safety always before him. This can be done only by education for safety.

Masonry Finish Produced on Concrete Building as Job Is Poured

A NEW method of placing concrete to achieve a smooth finish in one operation and which presents the appearance of a masonry finish on exteriors and a smooth finish for interiors, has recently been devised by a California contractor and is now being used successfully in Los Angeles and Oakland. The system was originated by the Scoñeld-Twaits Engineering & Construction Co., Los Angeles, Calif., and is simple and comparatively inexpensive to place, and saves labor and time as well as the cost of refinishing the concrete surface.



GENERAL VIEW AND CLOSE-UP OF THE CONTINENTAL CAN COMPANY BUILDING, OAKLAND, CALIF.

1. *Above, Transit Mixer delivering concrete to job; below, close-up of corner of building, showing close resemblance to masonry finish.*

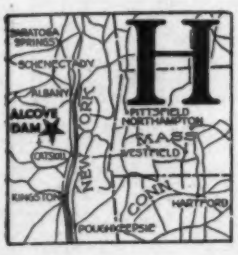
An excellent example of this new process is in the recently constructed factory building of the Continental Can Co., 54th Ave. and Russell Sts., Oakland, Calif. This is a three-story structure of reinforced concrete designed by Francisco and Jacobus, architects. About 8,000 cubic yards of Transit System mixed concrete furnished by the Hutchinson Co., of Oakland, operating on this job a fleet of 8 Paris Transit mixers, poured an average of 400 cubic yards in 8 hours.

One of the illustrations shows the corner of the exterior finish. The same smooth finish was obtained throughout the entire job without the need of any refinishing.

The masonry finish is obtained by nailing strips of molding to squares of pressed wood, the squares being about 4 x 6 feet. These squares were placed in the forms and the concrete poured in the usual manner. After two or three days the forms were taken down and the pressed wood squares used on another part of the job. The specifications called for 1:2:4 mix with 3 per cent of diatomaceous earth. The advantages of pouring and securing a smooth finish in one operation without the added cost of finishing are readily apparent.

Dispatch Marks Construction of New Dam at Alcove, N. Y.

Winston & Co. Building 2,177-Foot Dam to Create Reservoir of 1,400 Acres for Albany Water Supply



HUDSON RIVER water has become so polluted as to make it undesirable to continue its filtration for the domestic water supply of Albany, N. Y., the capitol of the Empire State. Work on a large earth dam was started on August 1, 1928, to impound the waters of Hannacrois Creek at Alcove, N. Y., about 15 miles from Albany. The contract for the entire project was awarded to Winston & Co., Kingston, N. Y., for $747,449.25. The contract calls for the completion of the work by June 1, 1930. Since the letting of the original contract, Winston & Co., has received the contract for clearing and grubbing the entire reservoir site.

Design of the Dam

The dam will be about 95 feet high where it crosses the stream and 2,177 feet long. It will have a top width of 15 feet, an inside slope of 1 on 3, and a downstream slope of 1 on 2½, with a reinforced concrete core wall in the body of the dam, resting on a cut-off wall with a thickness varying from a minimum of 4 feet to a maximum of 8 feet 2 inches. The upstream slope of the dam is to be covered with an 18-inch hand-laid paving of stone, set in a bed of crushed stone of 2½-inch size.

A drain for the reservoir was the first work to be completed in order to provide a diversion channel for the spring flood waters. The drain is of reinforced concrete, arched section, approximately semi-circular in section and measuring 8 feet wide and 6 feet 2 inches high and 520 feet long.

The spillway is located at the southern end of the dam, where suitable rock was found at a high elevation, permitting the construction of a solid concrete spillway of small height. The spillway will be constructed with stilling devices to reduce the velocity of the water as it reenters the creek below the dam.

The construction of the dam has necessitated the relocation of the existing highway, which will be carried over the spillway on a reinforced concrete arch bridge of 120 feet clear span. Other construction includes: a concrete intake structure, gate house, reservoir drain with gate chamber, sluice gates, outlet conduits, Venturi meter and pit, cast iron pipe, gate valves and paving for the spillway channel. The area flooded by this dam will be 1,700 acres, and the volume impounded will be about 12,000,000,000 gallons.

Sequence of Operations

Soon after the contract was awarded the contractor began hauling in coal for the steam shovels, and on August 1, 1928, started work stripping and ditching the site of the dam and the cut-off trench. On September 12, the Bucyrus-Erie shovel started work on the spillway channel, and on October 13 the first pour of concrete was made on the intake structure. On October 24, concrete was first poured on the reservoir drain. Only two days of concreting were done in 1928 on the cut-off wall before concreting was discontinued for the winter on December 22, 1928. Concreting was started again on April 2 with the Ransome 21-S, and on April 5 with the full mixing plant using a Ransome 28-S. During the winter of 1928-1929 only a skeleton force was maintained, and the work consisted of rock excavation in the cut-off trench and the making of forms for the intake structure and the bridge.

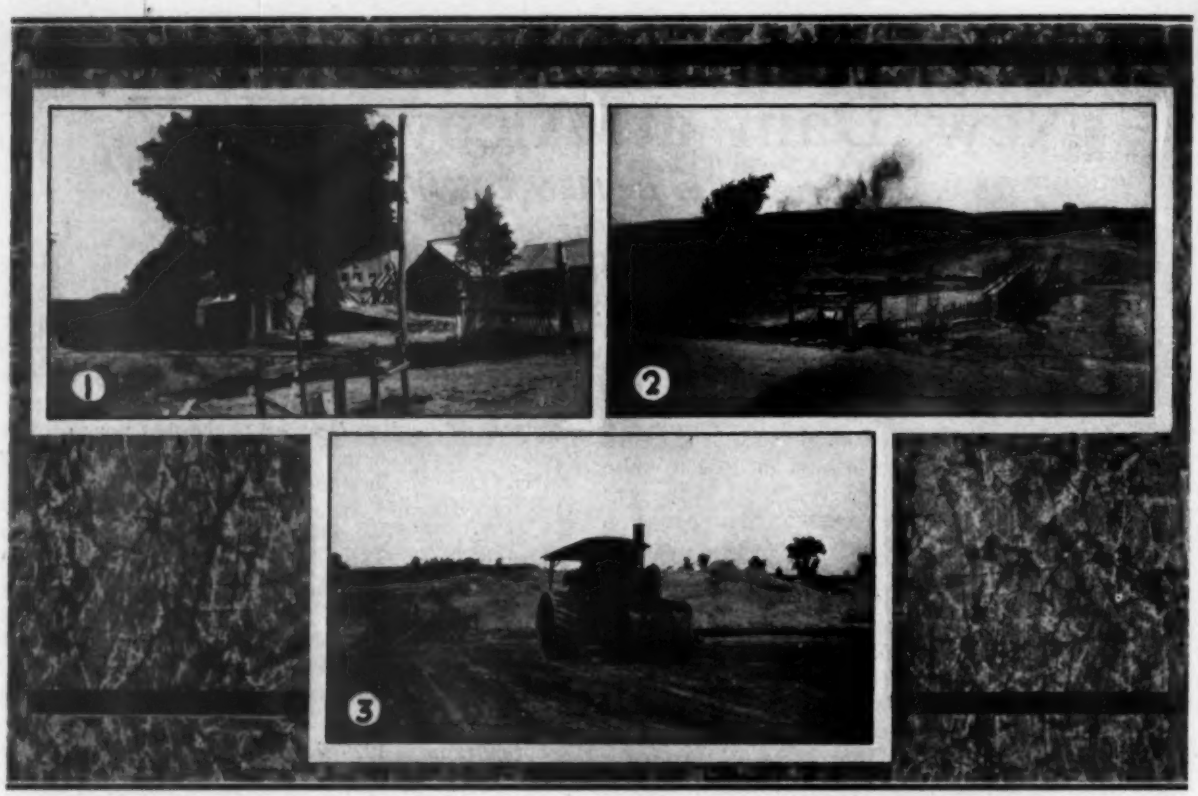
Spring rains in 1929 slowed up the work but did not stop it, as at that time the contractor was not working in the bottom of the valley.

Crusher and Concreting Plant

Stone removed from the cut-off trench was first used for concrete, then stone from stone fences in the neighborhood was crushed, and finally a small quarry nearby was used. Sand from the Hudson River is trucked in about 10 miles, and cement from the North American Cement Co., Helderberg brand, is trucked in and stored in a large cement shed. The haul is about 40 miles.

The crusher plant is a complete Reliance outfit, with a 14 x 22 crusher, bucket elevator and rotary screen discharging fines, two sizes of stone and over-sized. The crushed stone is stock-piled alongside the crusher plant, and is placed in the wooden bin with Blaw-Knox batchers below by a derrick operated by a Mundy hoist. The derrick also handles the sand from a pile replenished by the trucks dumping off a platform. The hoist, crusher and Ransome mixer are operated by steam from an Ames Iron Works boiler. Water for the boiler and for concrete mixing is supplied by a small pump in the bed of the creek about ¼ mile distant and stored in a 12,000-gallon wooden tank near the concreting plant.

A fleet of trucks, consisting of 8 Macks, 2 Internationals and 2 Federals, owned by a sub-contractor, is used to haul sand, stone and cement to the central mixing plant and also on the night shift for hauling earth for the embankment. All the concrete for the job is hauled by truck and dumped into hoppers, from which it is chuted with Lakewood chutes to the forms, or is dumped into a bottom-dump concrete bucket and hoisted to the forms by an Erie crane. This method has proved very flexible and economical, due to the relatively small amount of concrete and its distribution over a wide area.



CONSTRUCTION VIEWS OF THE ALCOVE DAM FOR THE ALBANY, NEW YORK, WATER SUPPLY

1. View of the crusher plant. 2. General view across the valley, showing the concrete core wall. 3. A 12-ton Monarch steam road roller with cleats rolling the earth embankment in 6-inch compacted layers

Concrete specified for this job included 1:2½:5 mix for cut-off trenches, spillway section, abutment walls on the spillway, channel paving, abutments for the arch bridge, intake structure, core wall, gate house and reservoir drain well. A mix of 1:2:4 was used for the arch rib of the spandrel walls, sidewalk on the bridge, reservoir drain, casing about the conduit pipes, and in the meter pit. A rich 1:1½:3 mix was used for hand rail of the bridge and in a few other similar places. Three pounds of Colloy, made by the Colloy Products Co., Joliet, Ill., are used to each bag of cement.

OUTLET CONDUITS

The outlet conduits consist of twin tubes of ⅜-inch steel pipe with welded 2½-inch lap seams and riveted at the joints. The steel pipe was furnished by the Walsh Boiler Works, Holyoke, Mass. These pipes were painted on the interior with bitumastic enamel and the outside completely encased in reinforced concrete.

GROUTING

At the south end of the dam adjacent to the cut-off wall and the gate house grout holes were bored 10 feet on centers for the cut-off wall and 15-foot centers for the remainder of the area near the gate house. The holes, all on the upstream side of the cut-off wall, are bored to depths of 30 feet and capped with 2-inch pipe. In the holes tested to June 18 little grout was required.

EMBANKMENT

Embankment operations are carried on from borrow pits, both up-stream and down-stream, from the core wall. The outfits working on this operation are duplicated, there being fifteen 3-up mule teams and bottom-dump wagons hauling earth from the two 30-B Bucyrus steam shovels to the embankment, where it is spread by a Caterpillar Thirty hauling an Adams leaning wheel grader with 7-foot blade. Rolling of the layers, which must be of such thickness that they will compact to not more than 6 inches, is handled by a 10-ton Buffalo-Springfield steam roller and a 16-ton Monarch steam roller with corrugated rolls. A Bucyrus-Erie shovel is making the spillway excavation, working with trucks. Another Bucyrus 30-B shovel is on its way to the work.

On night work when the trucks are used the entire area is flood-lighted with acetylene flares, which are gathered up every morning and cleaned ready for the next night and also to prevent damage to them during the day operations when they are not as conspicuous as at night and hence more likely to be damaged.

BLACKSMITH AND COMPRESSOR HOUSING

A wooden building convenient to the drilling operations and yet above the embankment area has been erected for the blacksmith shop, where two Ingersoll-Rand pneumatic drill sharpeners are installed with a coal forge. Adjacent to this is the compressor house, where 2 Ingersoll-Rand 10 x 8 portable compressors furnish air to a container outside the building at a pressure of 178 pounds.

QUANTITIES

Quantity	Operation
16,000 cu. yds.	Stripping excavation
25,000 cu. yds.	General earth excavation
3,500 cu. yds.	Trench, earth, 0-10 feet
800 cu. yds.	Trench, earth, 10-15 feet
600 cu. yds.	Trench, earth, 15-20 feet

350 cu. yds.	Trench, earth, over 20 feet
8,100 cu. yds.	General rock excavation
2,900 cu. yds.	Special rock excavation
200 cu. yds.	Grout
1,000 lin. ft.	Drilling holes in rock
320,000 cu. yds.	Consolidated embankment
25,500 sq. yds.	Top soil
35,000 sq. yds.	Grassing
11,200 cu. yds.	Slope paving
770 cu. yds.	Grouted slope paving
17,800 cu. yds.	Concrete masonry, heavy sections
8,800 cu. yds.	Concrete masonry, moderate sections
1,800 cu. yds.	Concrete masonry, thin sections
32 cu. yds.	Concrete masonry, hand rail
145,000 sq. ft.	Concrete protection
540 sq. yds.	Membrane waterproofing
680,000 lbs.	Reinforcing steel
2,800 sq. yds.	Road paving, 2-course macadam
1,050 lin. ft.	Guard rail

PERSONNEL

The work on the Alcove Dam is being done for the Board of Water Supply, Albany, N. Y., N. F. Towner, President, and J. M. Prior and Ed. Easton, Commissioners. The engineers for the Board are Whitman, Requardt & Smith, Albany, N. Y. Edward Schatz, Resident Engineer, and George Mirick, Assistant Engineer, represent Whitman, Requardt & Smith on the work. J. O. Winston is president of Winston & Co., the contractors. F. H. Trow is Chief Engineer, Major W. H. Balch, Principal Assistant Engineer, and T. J. Grady and G. I. Barger, Superintendents. The consulting engineer for the Board of Water Supply is Robert E. Horton, Voorheesville, N. Y.

Black Horse of the Sea

AN interesting book entitled "Black Horse of the Sea," written by Robert D. MacMillen and published by the Merritt-Chapman & Scott Corp., 17 Battery Place, New York, sets forth in an interesting fashion the history of that well-known firm. The strange title is taken from the symbol of the house flag of the company, which is known the world over as their symbol of service.

The company started in 1860 when most of the flourishing industries of today were in their infancy, if in existence at all. The business of the Merritt-Chapman & Scott Corp., was then concerned with salvaging. This phase has been a very important part of the service which has been rendered by them and still is a good part of the firm's business. Allied with salvaging was long-distance towing, heavy lighterage and lifting service.

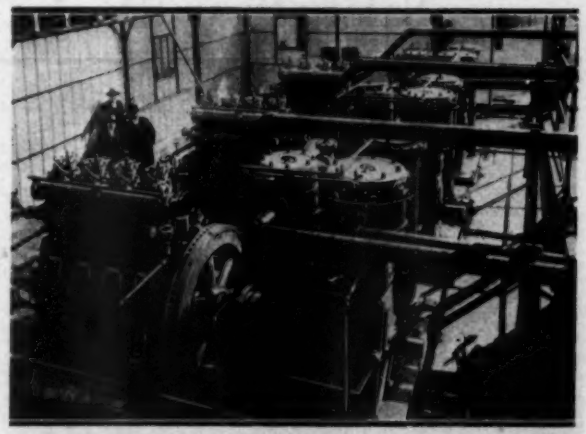
A natural outgrowth of work of this kind for a company like the Merritt-Chapman & Scott Corp., was interest in port and harbor development in America, and the company prepared to participate in these developments which have been so important in our maritime progress. The Merritt-Chapman & Scott Corp., now handles contracts for piers, bulkheads, sea walls, bridges, boardwalks, water front protections, tunnels, dams, sewers, outfalls and intakes, subaqueous foundations, submarine cable and pipe laying and dredging and rock removal.

The many activities and diversified fields of endeavor of this company is very interestingly and instructively told in the book "Black Horse of the Sea" and the story is accompanied by a number of fine photographs showing the Merritt-Chapman & Scott force in action on some of their most interesting jobs.

Troubles Are Triplets, Not Twins

ONE contractor with whom we recently talked, while not superstitious in the least, believes with the housewife that whenever one accident happens there are bound to be two others to follow immediately. In the case of this man just before the Fourth of July the paver reached a bad spot in the subgrade where a man could stand on the grade and make the ground shake like a certain part of the anatomy of the gentleman of the night before Christmas fame. When the paver hit that point it started to sink into the quaky material and had to be planked. This operation took considerable time and a line of hired trucks piled up behind the mixer. As soon as the mixer was safe and ready to operate the first truck backed up to the skip and started to dump. There was a loud report and the hoist gave way leaving the trunk unable to deliver its batches to the skip. A part of the grading crew was called in and in five minutes had the first batch unloaded, then another five minutes and the second batch was unloaded. No sooner had the obstreperous truck departed when the paver operator yelled for water and it was found that a bull frog had jammed the intake.

Moral, with apologies to Aesop's Fables of movie fame, "An ounce of prevention is worth a pound of cure, drain the subgrade well ahead of paving and your mixer won't start trouble."



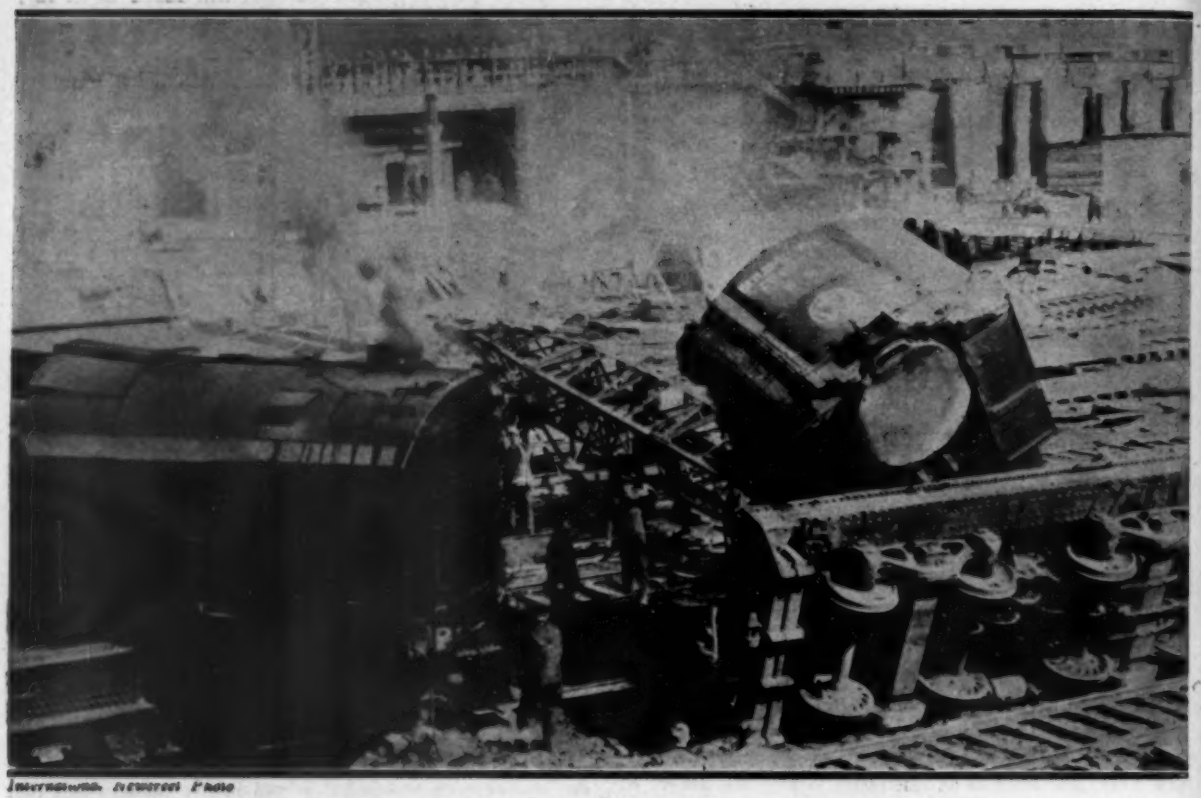
DIESEL ENGINES OPERATE AIR COMPRESSORS

Three 160-horsepower CP diesel engines direct connected to CP vertical air compressors and working on the extension of the Eighth Avenue subway under the Grand Concourse, Bronx, N. Y.

TRACTOR SHOVEL WITH SHORT BOOM MAKING CUT 13 FEET WIDE IN STICKY BLUE CLAY ON APPROACH TO THE DETROIT-WINDSOR TUNNEL

Colwell Brothers, Detroit, subcontractors on excavation, report that on the first week's operation this Bay City machine averaged 25 truck loads per hour or 260 per day. Since June 3 the shovel has operated 22 hours a day in two 11-hour shifts. The work is now about 45 feet below street level and on completion it will be about 95 feet

Safety First—Don't Overload Your Cranes



INTERNATIONAL NEWSREEL PHOTO

This Locomotive Crane Carrying Six Tons of Lumber Was Operating at the New Merchandise Mart in Chicago. The Load Was Too Much for the Crane, Very Probably Being Carried at Too Great a Radius. Every Operator Must Be Carefully Instructed as to the Amount of Load Which Can Be Carried at Various Distances from the Crane, so That Disasters Like This, Which Caused Loss of Life to Two Men, May Not Recur. Practice Safety First in Every Operation on Your Jobs. It Pays

Types of Connections for Wire Rope

EXPERIENCE with wire rope operators in almost every field and the number of accidents due to failure of connections bring out the fact that there are still many erroneous beliefs regarding wire rope connections and attachments.

It has been found that clip connections will develop efficiencies of better than 80 per cent when they are properly applied. This type of connection is improperly applied a large number of times. Too many riggers seem to prefer to stagger the clips, then pull the U-bolts up so tight as to crush the rope with a resulting destructive action that greatly reduces the safe operation of wire rope. The proper use of clips involves placing all U-bolts on the same side of the rope, and none of them pulled so tight as to crush the wires. These clamps should be relightened after the load is applied, then inspected regularly because such a connection is probably no more than 75 per cent efficient.

Socketing wire rope is another type of attachment entirely dependent upon the varying human element for its efficiency percentage. In this type of connection much depends on the cleaning of the wires, the thoroughness with which the job is done, the degree of heat for the molten babbitt or zinc, how well the wire rope has been broomed to wedge into the basket and finally how efficiently the molten metal has penetrated into every crevice of the broomed or wedged rope end.

Wire rope is perhaps not so hazardous as other pieces of equipment. However, accidents in which wire rope is a factor are not limited to those caused by the failure of the line itself. There are too many cases where the wire rope has been either a contributing factor or the actual cause of a very costly accident. Projecting wires are an all too common source of lacerated hands, while improperly applied clips, attachments or fittings too often permit the failure of a wire rope at its point of connection. In spite of the fact that wire rope does not contribute as heavily to our accident records as other types of equipment, accidents of this kind are of sufficient frequency and severity to warrant the constant attention of every wire rope operator. Guarding sheaves with barriers, keeping wire rope properly lubricated, insisting upon the employment of the proper sheaves, a more careful selection of wire rope construction and types, and the more painstaking application of attachments will do much toward the elimination of accidents due to wire rope operation.

Eighth Paving Conference to Be Held at West Baden

THE Eighth Annual Asphalt Paving Conference will be held October 28-November 1, 1929, at West Baden, Ind., under the auspices of the Asphalt Association, New York. Special attention is to be paid to the improvement of farm-to-market roads, airport paving, as well as city street construction and trunk line highway improvement. The dominant feature will be the discussion of the latest and most economical methods for the construction with asphalt of low cost surfaces of secondary and tributary highways. Salvaging of existing gravel and macadam roads and their utilization as bases for low cost asphalt surfaces will be considered.

The Association of Asphalt Paving Technologists will hold its Annual Meeting in connection with the Conference.

Erection Methods Used on the Blair Bridge

By C. M. Coff

Office Engineer, Woods Brothers Construction Co., Lincoln, Nebraska

IN this day of extensive travel, saving in road time is given considerable attention. We see evidence of this on all through-highways where sharp turns have been eliminated, and where highways have been taken out of the small towns to go through the outskirts.

Near Blair, Neb., a ferry on the Missouri River effected a saving of 28 miles for tourists traveling on the Lincoln Highway. For the past several years the number of cars crossing at this point averaged approximately 14,000 per year.

Interest in the possibilities of a modern highway bridge over the river at Blair had been increasing during the last fifteen years, and various plans and projects were attempted by which this desire could be realized.

Delegations waited upon the Legislatures of both Nebraska and Iowa urging appropriations for the construction of a bridge; appeals were made to the Federal Government to aid in the project. Citizens of Blair a few years ago even went so far as to secure a franchise for the construction of a bridge at this location, but met with failure in their endeavor to raise funds, either locally or within the State, with which to build a so-called free bridge.

About a year ago a number of enthusiastic citizens got together and secured a franchise for the construction of a toll bridge. Many difficulties were encountered by these enthusiasts, both in furthering their plans for construction and in securing the interest of investment bankers to advance the necessary funds. These men soon got in touch with Woods Brothers Corporation, and by a combination of this Lincoln firm and the local originators of the idea, The Nebraska-Iowa Bridge Corporation was organized to finance the construction of this modern highway bridge.

A location 200 feet south of the Chicago & Northwestern Railway bridge between Blair, Neb., and Missouri Valley, Iowa, was selected and secured. The construction of this bridge results in shortening the Lincoln Highway a distance of 28 miles between Missouri Valley, Iowa, and Fremont, Neb. The total distance between these two points by way of this new bridge is 34 miles, whereas the distance on the route formerly in use by way of Council Bluffs and Omaha is 62 miles, 10 miles of which are through the congested traffic of these two cities with countless intersections and hazards.

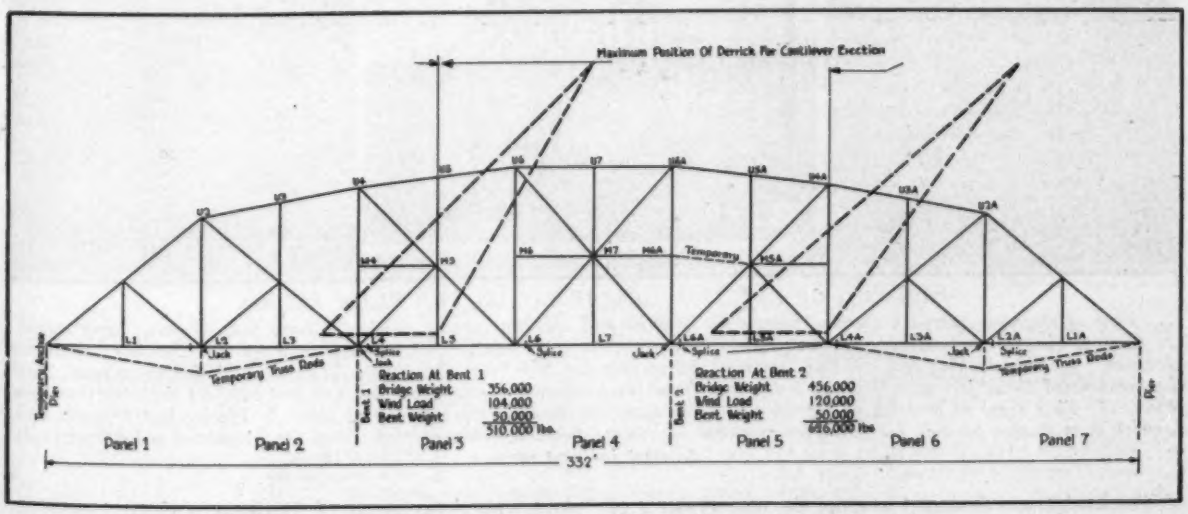
General Description of Bridge

The bridge consists of three 333-foot steel trusses, two 100-foot deck trusses and four 35-foot I-beam approach spans, with a 20-foot clear roadway and a concrete floor throughout. The overall length, including earth approaches, is 2,800 feet.

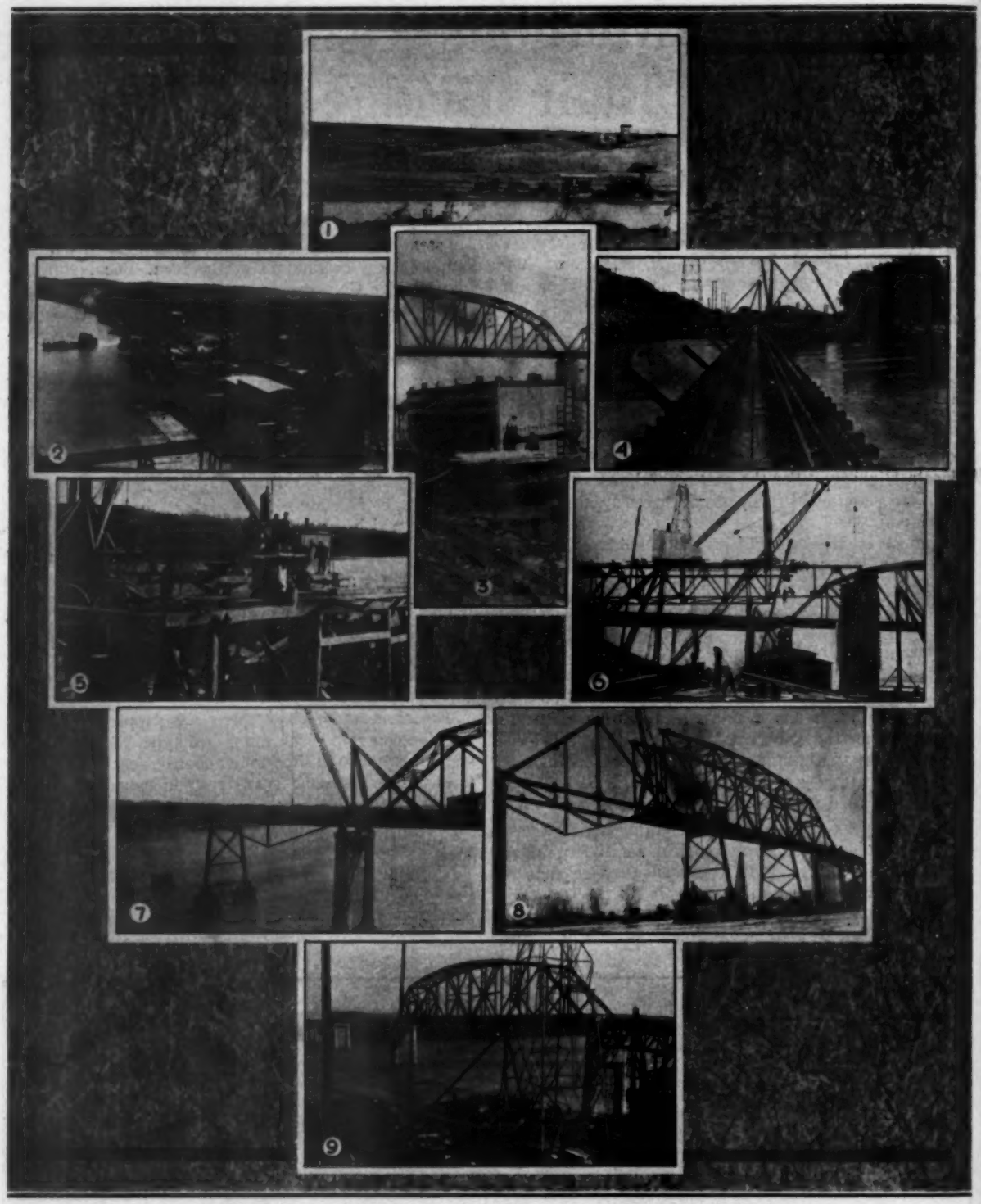
The three main river spans are supported on four massive concrete piers, dumb-bell type, the footings of which rest on solid limestone about 65 feet below water level. The approach spans rest on concrete pedestal piers supported on creosoted timber piling, which vary in length from 35 to 40 feet. This bridge provides a vertical clearance of 52 feet 6 inches at high water level.

The approximate quantities of materials involved in the construction were as follows:

Concrete	5,600 cubic yards
Structural steel and reinforcing steel	2,710,000 pounds
Earth fills	85,000 cubic yards



Erection Diagram of Missouri River Bridge at Blair, Neb.



PROGRESS OF ERECTION OPERATIONS ON THE BLAIR BRIDGE

1. View of the west approach showing borrow pit in front and elevating grader ready to dump into 11-yard dump wagon. 2. General view of material yard showing gravel bin, concrete plant and part of tramway in front. 3. Building caisson on pontoon. 4. View looking east showing tramway and staging for Pier 5 on east bank. 5. Process of sinking caisson. Steel bucket hoisted to surface dumping out loose rock from the bottom of caisson. 6. Erecting first 100-foot deck truss on west bank. 7. First stage of erection of second main river span. Note derrick set on top of pier. 8. Placing last 2 panels with derrick in maximum position for cantilever erection. 9. First span completely erected. Steel bents removed and derrick ready to start for next span.

The bridge was designed to meet the requirements of increased loads for future traffic, and in accordance with American Association of Highway Officials specifications.

EARTH APPROACHES

The fill on the west approach was made of dirt taken from a borrow pit along the south side of the fill by means of a Strout elevating grader. Four 5-yard La Plant-Choate dump wagons and one 11-yard dump wagon pulled by five 15-ton 60-horsepower Caterpillar tractors constituted the equipment for this work. Because of the presence of sand on the east side of the river bank, it was considered expedient to employ other than the borrow pit method of making the fill. This fill was made of sand pumped out of the Missouri River by means of an 8-inch centrifugal pump stationed about 400 feet from the bank and erected on a pontoon. The power was furnished from a nearby transmission line.

Work on the west approach fill began August 16 and on the east fill August 30, both being completed November 17, 1928. About 55,000 cubic yards of fill were placed on the west approach and 28,000 cubic yards on the east.

FOUNDATION

Inasmuch as a spur track running parallel with the river bank was already located on the west bank, this track being used by the Chicago & Northwestern Railway for hauling rock for bank protection, it was found desirable to locate the concrete plant and power plant on the west bank. Gravel was unloaded from cars by means of a stiff-leg 15-ton derrick, located on the north side of the concrete plant, and into a stock pile on the west side of the track. This derrick was also used in loading gravel into the bins. The cement was stored in a cement shed located east of the track, the floor of the shed being built level with the cars to facilitate unloading the sacks with wheelbarrows. An air plant, consisting of 3 Farquar 80-horsepower boilers, 2 Ingersoll-Rand compressors, 1 Gardner duplex air compressor and 1 English Bros. gas-engine air compressor, with a capacity of 2,000 cubic feet of air per minute, was assembled on the west bank under the C. & . W. Railway approach span about 12 feet west of the first river pier. A 21-S Knickerbocker gasoline mixer fed by gravity was used for mixing all concrete for the entire foundation job.

A tramway 1,100 feet long was built about 30 feet north of the center line of the new bridge. This tramway carried an industrial track and the air pressure pipes, at the same time serving as a means of transporting all materials to the various constructing units. Concrete was hauled on Lakewood flat cars in two 1-yard Stuebner buckets, and unloaded into the pier caissons or forms with a stiff-leg derrick mounted on a barge.

PIER CONSTRUCTION

Construction of the foundation began June 28, 1928. The two approach bents and pile pier No. 1 on the west bank were built first. After the tramway was constructed, work began on the main river piers, starting with pier No. 5 on the east side. Pneumatic caissons were used for sinking the four main river piers to solid rock. The caisson was built of heavy framed timber with 2-inch sheeting, the average dimensions being as follows: 15 feet wide, 38 feet long and 40 feet deep. The first caisson was launched September 21 and landed in rock October 5, 1928. A keyway was dug out 18 inches wide and 2 feet deep into solid limestone under each foundation footing. The first caisson was sealed October 7, 1928.

The highest pressure under which the men worked was 30 pounds per square inch. Average friction per square foot of surface in the caisson was 480 pounds; the average elevation of water level during the period of construction was 583, and elevation of limestone was 524. It took about twenty days to complete the foundation for each pier, this period including the launching of the caisson and completing the seal.

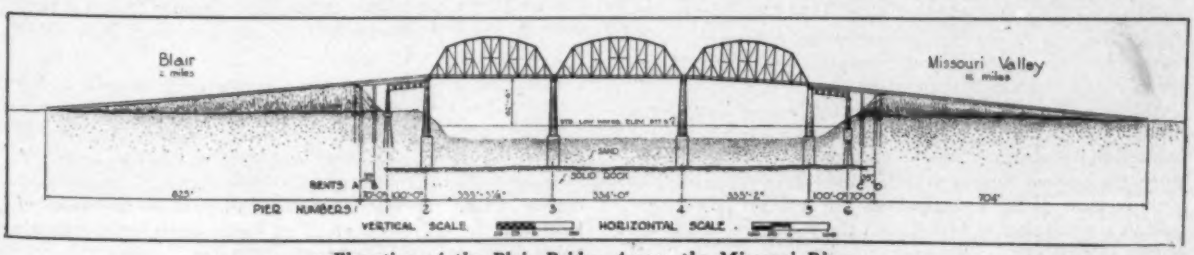
All foundation work was completed on January 12, 1929. About 100 men were employed on this portion of the structure.

STEEL SUPERSTRUCTURE

Erection of the steel superstructure commenced from the west side on January 20, 1929. The location of a spur track upon which the steel was brought in determined the starting point. An Orton & Steinbrenner 25-ton locomotive crane unloaded the steel from cars into a storage yard about 1,000 feet north of the bridge along the west bank. A steel derrick with a 120-foot boom, stationed on the ground about 50 feet south of the center line of the bridge and close to the toe of the west fill, placed the steel on a specially built 20-foot flat car which was set on a standard gage track on the floor of the first 100-foot deck truss.

From this point the loaded car was moved along the track to the point of erection by means of a ⅝-inch cable strung along one side. A rather interesting feature here was the use of the cantilever method on the three main river spans. This method was adopted in order to reduce the hazard from floods and ice jams. Steel erection proceeded as follows:

A 20-ton steel derrick with 110-foot boom was mounted on the erected floor of the first 100-foot deck truss. With the position of the boom on top of the first river pier, a steel bent about 51 feet high was placed on a cluster bent constructed of 18 wooden piles. The piling were about 65 feet long and were driven to refusal. They were cut off and capped at approximately highwater level. Then the bottom chords of the first two panels were swung into position, the east ends



Elevation of the Blair Bridge Across the Missouri River

resting on the first steel bent supported by adjustable jackscrews. These chords were then trussed at the bottom in order that they might act as beams in supporting the weight of the rest of the members until all were bolted together. In this manner all members up to the second panel point (or Joint L-4, as shown in erection sketch) were completely assembled. The derrick was then moved ahead and set over the first steel bent.

In this position the second steel bent was erected, which was located at the fourth panel point, or about 190 feet east of the west end of the truss. This bent was supported on a cluster bent consisting of 24 wooden piles. The bottom chords of panels 3 and 4 were swung, and thus all members up to Joint L-6A were erected in place. The derrick was then moved to bent 2, and panel 5 was erected from this position. A temporary diagonal member was placed in this panel (as shown on the erection sketch) to take care of the tension incurred from the cantilever action on the panel. The derrick was finally moved to the unsupported end of panel 5, which move marked the maximum position of the derrick for cantilever erection. With the derrick in this position the last two panels, 6 and 7, were erected, with the bottom chords braced similarly as in the first two panels. The steel bents were then dismantled and used for the next span.

Proceeding in this manner, it took only eleven actual working days to complete the erection of one continuous span. Two riveting crews followed the erection from start to finish. About 30 skilled men on the average were employed in this work.

Erection of the entire steel superstructure was completed on May 20, 1929. The contractor expedited the concreting of the floor spans to hasten completion of the structure, and was successful, as the bridge was opened for traffic on July 1, 1929.

PERSONNEL

The Nebraska-Iowa Bridge Corp., Lincoln, Neb., is the sole owner of this bridge. Woods Brothers Construction Co., of Lincoln, Neb., were the general contractors. The Kansas City Bridge Co., of Kansas City, Mo., placed the foundation, and Wisconsin Bridge & Iron Co., of Milwaukee, Wis., fabricated and erected the superstructure. Harrington, Howard & Ash, Consulting Engineers, of Kansas City, Mo., designed the structure, and Sverdrup & Parcel, St. Louis, Mo., were Supervising Engineers.

New York State Contractors Required to Maintain Pavements

MOST of the cities in New York require contractors to guarantee the maintenance of new pavements for a certain number of years. According to the New York State Bureau of Municipal Information 28 cities require a maintenance guarantee of five years, 6 require two years, 9 require one year, 2 require six months and 6 have no requirement. In most of these municipalities the same guarantee applies to all types of pavements.

Although the enforcing of these guarantees varies widely in the different cities, the majority of the cities retain a certain percentage due the contractor to enforce this maintenance guarantee, the amount ranging from 5 to about 15 per cent. However, in most of the municipalities the retained percentage is paid in a much shorter period than the guarantee, if the work proves satisfactory.

The Battleship Deck Floor

AN investigation has recently been started by the American Institute of Steel Construction of an new type of floor construction which is known as the "battleship deck" floor. This is a steel plate floor, which it is estimated will give greater strength and stability to buildings, reduce the loads on the columns and therefore be especially valuable in skyscraper construction.

When the skyscraper came into existence it provided multiple tiers of floors, one above the other supported on a steel skeleton frame consisting of steel columns, girders and beams. At that time the steel industry furnished only the skeleton frame, which provided supports for the numerous floor panels. Originally these floor panels were made of brick arches, later of flat arches and still later of other types of materials as wood, packed floors, reinforced concrete and Gypsum. At the inception of the multiple story building, the art of welding was unknown as it now exists, but the progress which has been made in this field has made possible the development of a type of steel floor which can meet every requirement that a floor construction is called upon to perform.

Present methods of construction involve the use of material in floor panels which constitute the dead load that is generally considered more in weight than the live load which is to be supported. This excessive dead weight must be carried into the skeleton frame, girders and columns and ultimately to the foundations. It is evident that one of the conditions limiting the heights of multiple story buildings is the capacity of the foundations to carry the dead load of the structure, which is greater than the calculated live loads.

By the use of steel plates and ordinary structural steel beams, it is proposed to develop a welded steel floor which will stand every service that it may be subjected to. In such a floor it will be possible to determine in advance the stresses in all parts and which will recover instantly a full one hundred per cent of its deflection due to live load when that load is removed.

It is proposed to have 3, 4, 5-inch or other rolled I-beams of whatever depth is found necessary, spaced 24 inches apart and spanning from girder to girder of the structural frame. Along the tops of these beams will be laid continuous steel plates 3/16 or ¼ inch in thickness and wide enough to leave a space between their edges approximately ¼-inch wide. The edges of the plates will be immediately over the center line of the webs of the small beams, and an automatic welding machine then works the edges together and at the same time welds them to the top flange of the beam immediately over the web. The result is a built up T section with the plate acting as the upper flange and the beam acting as the vertical part of the T.

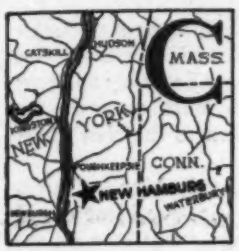
It is assumed that this combination construction will be made continuous over the tops of the supporting girders, or by framing them into the girders flush on the top and have the floor plates continuous.

The cost of welding the bead between the edges of the plate and to the top of the beams has been estimated by different contractors and it is estimated that the cost would be between 2 and 4 cents per linear foot. Inasmuch as the welding will be done along a line, but a short distance from the neutral axis, the difficulty of the floor curling up due to shrinkage will be practically negligble.

With this type of floor construction there is generated a solid steel deck which will act as a girder to prevent any torsional distortion of the building when subjected to wind or earthquake action. The floor construction can be carried out into the walls to provide spandrel construction to support the outside walls. It will be possible to provide any form of treatment to the top surface of these plates, either mastic finish, linoleum, cork tile or other form of covering.

Plant for Tunnel Job Moved by Barge

Walsh Construction Co., Contractors, Davenport, Iowa, Start Work on New Hamburg, N. Y., Tunnel For New York Central Railroad



CONTINUING its program of opening up the bottle neck along the east shore of the Hudson River where two tracks have served both local and express passenger and freight traffic for many years, the New York Central Railroad recently let a contract to the Walsh Construction Co., Davenport, Iowa, for a tunnel at New Hamburg, N. Y., paralleling the old tunnel, which has been in service for many years. The last twenty months has seen the completion of a third and fourth track between Garrison and Beacon, N. Y. This four-tracking will be continued at the end of the present contract and will be completed in about one year.

Design of the Tunnel

The new tunnel includes an open cut 195 feet long at the north end, followed by a two-track tunnel about 458 feet long and then an open cut at the south end about 1,015 feet long. The tunnel, which has an arched top, measures 22 feet from the top of the rail to the top of the arch and 3 feet from the top of the rail to the grade. The tunnel is 33 feet wide, and has 8-inch vitrified tile pipe drains at either side of the base in ballast. The tunnel concrete lining is to be 2 feet thick minimum at the top and 2 feet, 6 inches at the sides. The sides will contain fiber conduits for electric wires as well as the usual safety niches.

Following the completion of the new tunnel, the ex-

Method Used to Move the Bucyrus-Erie 50-B Steam Shovel and Three Mack Trucks from a Wharf at New Hamburg to the North End of the Tunnel. The Barge Was Hauled in as Close to Shore as Possible by the Hand Winch Shown at the Left and Then Cribbing Placed Out Over Which the Shovel Was Run Onto the Shore.

isting tunnel, the center line of which is 93 feet east of the center line of the new tunnel, is to be enlarged to the same dimensions as the new tunnel and part of the curve within the tunnel eliminated. This will bring the center line of the two tunnels approximately 87 feet apart. For a distance of 350 feet at the south end the old tunnel is to be converted to an open cut, and then the following 498 feet of the existing tunnel are to be enlarged and lined with concrete.

EQUIPMENT FOR DRILLING OPERATIONS

In the heart of the village of New Hamburg, concrete foundations were cast for five Ingersoll-Rand compound air compressors operated by diesel engines. Two foundations were first cast, the compressors installed and housed. Then the foundation for the three remaining compressors were poured by a Jaeger mixer, as illustrated. Two of these 16½ x 13¼ x 19-inch compressors are sufficient to supply each end of the tunnel operations where five drillers are used during the day and seven at night. The day shift uses three Ingersoll-Rand jackhammers and two tripod drills. The fifth compressor will be used as a standby unit in case of a breakdown in any of the others over a period of one year when they will be in operation, and also to throw in on the line in case of a temporary excess leakage of air.

Adjacent to the compressor house is the shed, where an oil blast drill steel furnace is located with a compressed air sharpener.

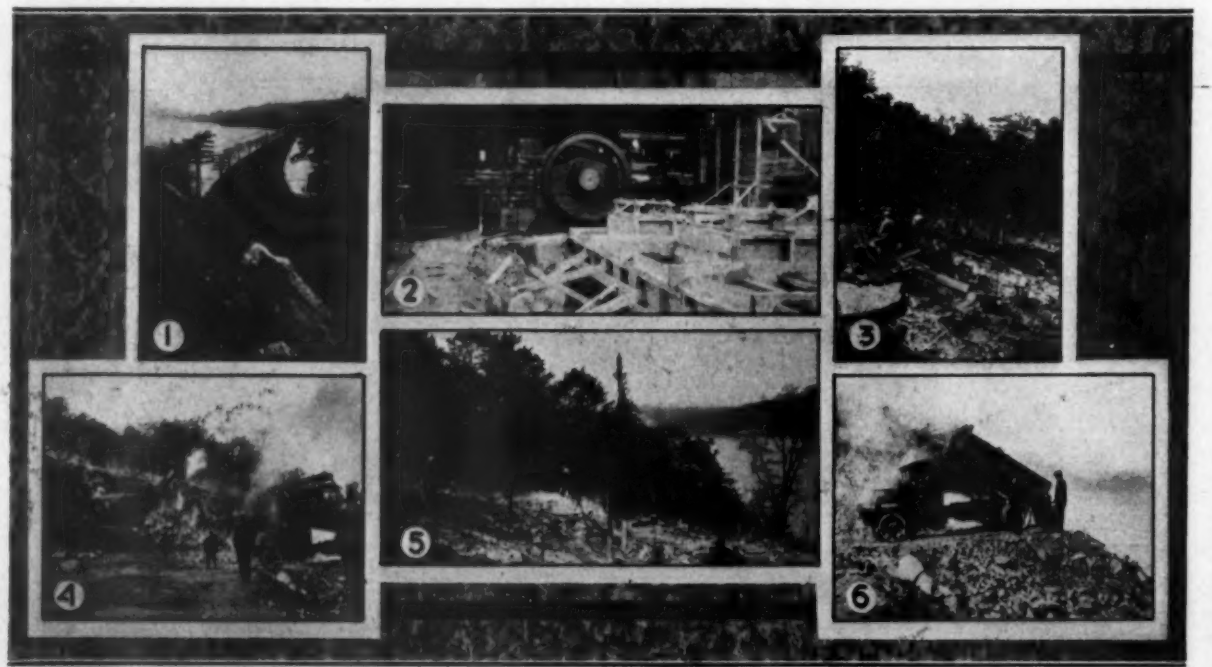
The present operations opening the faces at the two ends of the tunnel are handled by drilling 18 to 20-foot holes in the face and down from the top. The rock is a solid igneous intrusion, which makes for hard drilling. The face holes are usually completed during the night shift, and are shot at 6 in the morning, while the top holes are blown as completed during the day.

Night work on the north face has been speeded up by illuminating the entire area with Carbic acetylene flares and one large General Electric floodlight. All electric current for use on this job is purchased from the Central Hudson Gas & Electric Corp.

MOVING THE EXCAVATING EQUIPMENT

The Walsh Construction Co., shovel crews worked fast to get the Bucyrus 50-B shovel assembled after it was received on Friday, May 10. All day Saturday and part of Sunday was spent in getting the machine off the flat car, completely assembled and down to the New Hamburg wharf.

Tide conditions were just right early Monday morning, May 13, when H. C. Kahl, Vice-President of the Walsh Construction Co., called out every man on the job at 2 A. M. to do his part in starting the 50-B on its way. The tide was ebbing at 2:30 when the loading operations began. First, the three Mack trucks were run out onto the barge and securely blocked. Then, when the tide had dropped sufficiently, the 50-B was run out under its own power. The barge was then towed out by two small power boats until it grounded off the New Hamburg Yacht Club about 6 o'clock in the morning. At noon on the flood tide the barge was slowly moved the remainder of the distance to the site of the north end of the tunnel, where the shovel and trucks were unloaded about 8 o'clock in the evening.



EQUIPMENT AND WORK AT THE NORTH END OF THE NEW HAMBURG TUNNEL OF THE NEW YORK CENTRAL RAILROAD

1. Looking north along the existing double track to be paralleled at the left with new tracks on fill from the new tunnel. 2. Two of the five Ingersoll-Rand compound diesel-operated compressors at New Hamburg, N. Y., with foundations for three more in the foreground. 3. Top of the cut showing clearing and jackhammer drilling. 4. The Bucyrus-Erie 50-B steam shovel and two of the Mack trucks which were moved around from New Hamburg by barge shown working on the north face. 5. Same as 3, showing a more westerly section of the face with flares ready for night work and the Hudson River at the right. 6. Mack truck with St. Paul hoist making fill for the two new tracks with rock from the cut.

Bucyrus-Erie 100-B Steam Shovel Working on the South End of the New Hamburg Tunnel on May 30, Taking Out the First Rock Blast at That End and Loading It Into Western Dump Cars.

The cribbing and stringers for the unloading runway had been loaded on the barge at the start of the work. As soon as the barge was pulled up as close to shore as possible, using the hand winch, the runway was built up and the shovel and trucks unloaded for their isolated operations at the north end of the tunnel.

Work on the approaches to the tunnel began Tuesday morning, and the small photographs showing this work were taken the following Saturday, showing the progress which had been made. The three Mack trucks shuttled back and forth from the shovel dumping into the river, forming a fill over which the two new tracks to be laid will be run. The first photograph in this group shows the present double-track layout looking north from the face of the cut. The two new tracks will run practically straight across the open water at the left to the projection of the land seen in the background. On May 20 work was started at the south end, where a Bucyrus-Erie 100-B shovel loaded the blasted rock into 12-yard Western dump cars.

PERSONNEL

This work is being done under the direction of F. B. Freeman, Chief Engineer, E. A. Dougherty, Designing Engineer, New York Central Railroad, with A. D. Duffie, District Engineer, and T. P. Lynch, as Resident Engineer. Charles Bessenecker is General Superintendent of Walsh Construction Co., with H. C. Kahl, Vice-President, and Edward Walsh, Treasurer, also active on the job.

A Correction

WE wish to correct a misstatement in the article entitled "New Concrete Highway in Cliff Dweller Country," which appeared in the June issue of CONTRACTORS AND ENGINEERS MONTHLY. In this article was the statement to the effect that a Lakewood finisher was employed in finishing this New Mexico highway. The type of finishing machine used on this job was, however, a Maxon finishing machine and not a Lakewood, as stated in the text.

First Aid Training Pays

DURING the first part of 1928, a company in California gave some 2,000 or about 65 per cent of its employees the regular United States Bureau of Mines course in First Aid to the Injured. This training along with some other minor educational work, showed some very interesting results. The company's annual report shows a 39.7 per cent reduction in the number of lost time accidents, 44.6 per cent reduction in number of days lost time and 26.2 per cent reduction in compensation and medical costs. The company feels that these reductions were due to the first aid training.

Accidents occur in unexpected places, and when they do occur it is a tremendous and important help to have some one on hand who can administer first aid until more experienced medical aid can be secured. First aid training not only provides for the emergency treatment of accidental injuries but it also contributes to their prevention.

A knowledge of first aid makes a man think about himself in terms of the physically handicapped man, it makes him think of the actual cost of the accident in pain and suffering, it gives him a better understanding of the make-up of the human body, it teaches him how the average accidents occur and how they can be avoided and sets up in his mind a desire to avoid them. In other words, it stimulates thinking in terms of safety.

Work on Municipal Airport Progressing Rapidly

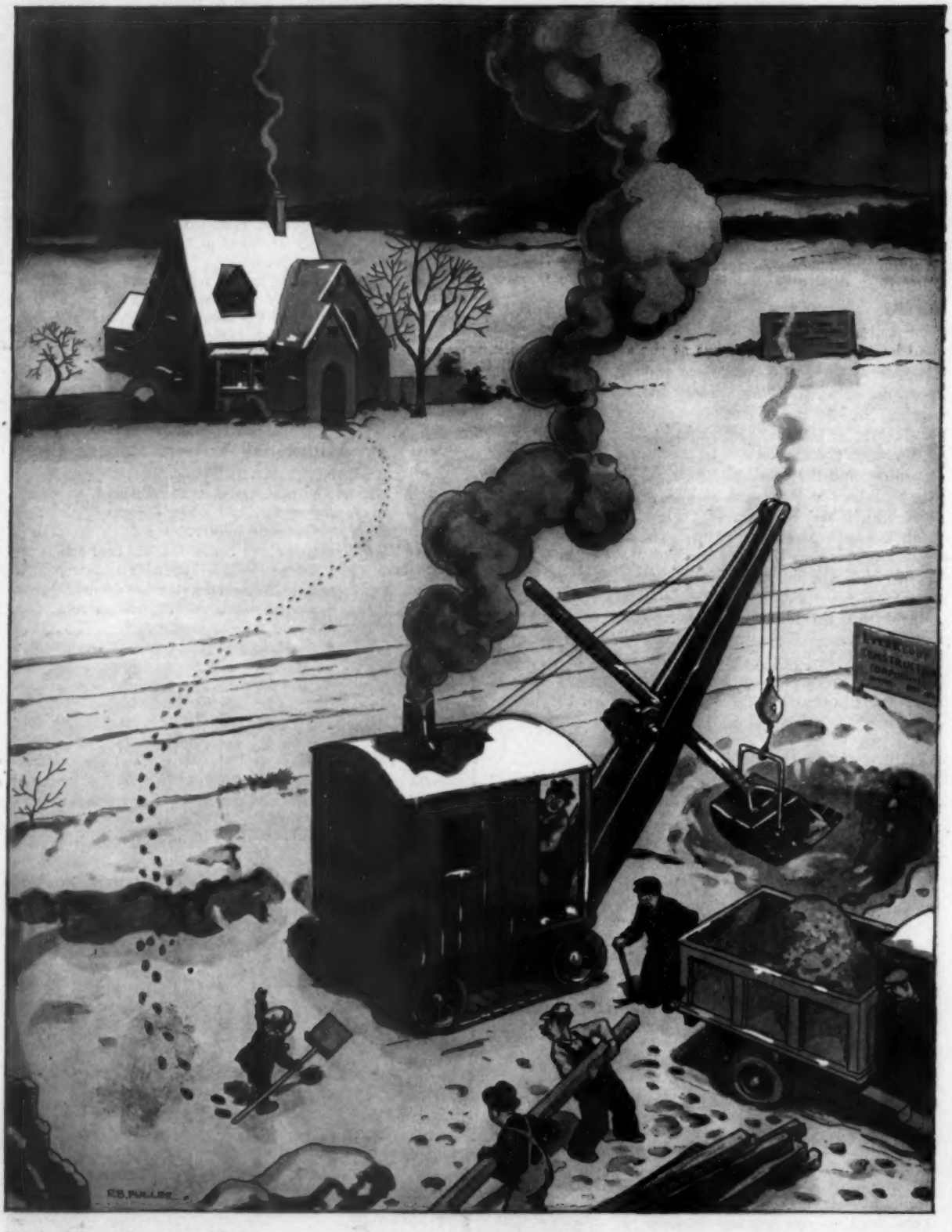
WORK on the new Akron, Ohio, municipal airport is progressing rapidly and when completed, the field will cover approximately 700 acres. It is to be a combined heavier-than-air and lighter-than-air field and is located about 3½ miles southeast of the city of Akron. At one end of the port the hangars for the Goodyear Zeppelin Corp., are being erected in which two 6½-million cubic foot airplane-carrying zeppelins will be constructed.

The contract for the dirt moving and leveling was awarded to Cable Brothers, Canton, Ohio, who are using a Galion motor grader and a Galion Master roller in their work of preparing the field. The port will be finished about January, 1930. A temporary landing field on the port is being used now until the permanent field is completed.

B. E. Fulton is Manager of the Airport and the construction is under the direction of Fred E. Swineford, Director of Public Service of the city of Akron, Ohio.

A Galion Motor Grader and a Galion Master Roller at Work on the Akron Municipal Airport. One of the Goodyear Blimps Is Shown Inspecting the Work.

The Hopelessness of Hand Labor



Reproduced through the courtesy of Judge

"Hey, there, fella, when you get through shoveling here, you might come across the street and give me a lift."

Hints for Better Paving

By A. Stellhorn
Wooster, Ohio

PAVING operations may be classified under, 1, setting and moving forms; 2, fine grading, including rolling; 3, unloading and proportioning materials; 4, hauling materials; 5, mixing and placing; 6, finishing; 7, curing.

If the original rough grade has been carried not to exceed 0.2 foot high, the form setting and fine grading is rather a simple operation. A good foreman, a formgrader, a subgrader, a roller and a scarifier, are the prime requisites. If hauling is done over the grade, complications are bound to set in. These may be avoided by subgrading at night or before the mixer starts and after the mixer shuts down.

There is a decided tendency for engineers to specify 500 feet of subgrade to be complete in front of the mixer. I am not sure that this is always desirable. If a finished subgrade ever starts to rut the more that is completed ahead of the mixer, the more trouble is caused. Rain on a long stretch of finished fine grade can also cause real trouble.

The Acid Test

Perhaps a job is run efficiently if it makes money and inefficiently if it does not. That is, at least, the acid test as far as a contractor is concerned. The chief engineer of a large concrete pile company said to me some time ago, "I have found it does not pay to try and get every dollar out of a job." I believe he is right. Organize to get volume, take care of the large items, systematize and coordinate, do not get in your own way and you will be able to skim the cream off a job even if you let some of the skimmed milk get away. Volume and coordination mean economy and efficiency and these spell prosperity for the road builder of today.

Handling the Aggregate

This is usually the place where paving contractors fall down. The mixer must have material in front of it or it cannot build roads. The materials can be unloaded by belt or clamshell or any other device, then proportioned by weight or measure, hauled on an industrial railroad or batch truck, but material must be kept in front of the mixer.

The mixer will handle in a general way more material than it will be economical to get to it. The placing of the concrete and steel should never be the limiting feature of a job. If good equipment is used and good operators hired, mixing and placing of concrete becomes more or less a routine affair.

Finishing

Finishing has become comparatively easy, but now we have impressed joints, both longitudinal and transverse, dowel, contraction and expansion joints. Whether these things are worth the price or not, I do not know, but another bottleneck has been introduced into the operation of paving, and finishing now must be watched or production is curtailed.

Curing

There is so much difference of opinion and practice in curing concrete that unless some extremely unusual method is employed, all the contractor can do is to allow a reasonable figure for the cost and then satisfy the engineers.

As far as economies for the contractor are concerned, any method which will let him get rid of the curing quickly is desirable, even though the first cost is a trifle high. There is usually more bickering and less understanding about the curing of a concrete pavement than all the other operations combined.

Good Management Essential

Each individual and separate operation in the building of a concrete pavement is simple and easy. The real difficulty is to coordinate all of the operations. They all must go on simultaneously if volume is to be obtained. System and coordination, if there are any, are volume production, and unless volume production is obtained the modern contractor cannot make any money, and unless he makes money he goes out of business.

Periodically, groups of engineers make time studies on road construction, and then road builders are told just what poor managers they are. The report is 100 square yards of pavement loss to delays on subgrade, 300 square yards due to no material at the mixer, 50 square yards due to delay caused by moving water hose, etc. Some of these well-meaning critics forget that the contractor is building roads to make money, not to make records. What he is interested in is the balance on the right side of the ledger at the close of the year, not letters of appreciation. This is no plea to discredit good management. In fact, poor management will, in this day and age, put a contractor on the rocks in a hurry, but often the things a contractor does, seem to the outsider to have no rhyme or reason, but they still may be good business in a financial way and also expedite the construction of the pavement.

Team Work and Schedules

It may, perhaps, be just as efficient to work twelve trucks on a road concreting job to maximum efficiency and allow for some loss in the mixing and finishing as for the contractor to burden himself with additional hauling equipment just to keep the mixer busy. Construction organizations are like football teams. They must be developed over and over again year after year.

The best results are obtained if they are built up to their maximum efficiency during August and September, when normally the best weather conditions prevail.

One mile a week of 18-foot or 20-foot Illinois type road is fine, but better financial results usually prevail if a schedule of two miles every three weeks is actually adhered to. This works out to something like 12 miles of road paving per crew in a year, allowing about two weeks for moving from one job to another. Unfortunately, in Ohio and neighboring states, there are very few, if any, 12-mile road jobs and on the few that do come up the engineers usually specify that two concreting crews must be used, and here again, efficiency and economy are shot to pieces.

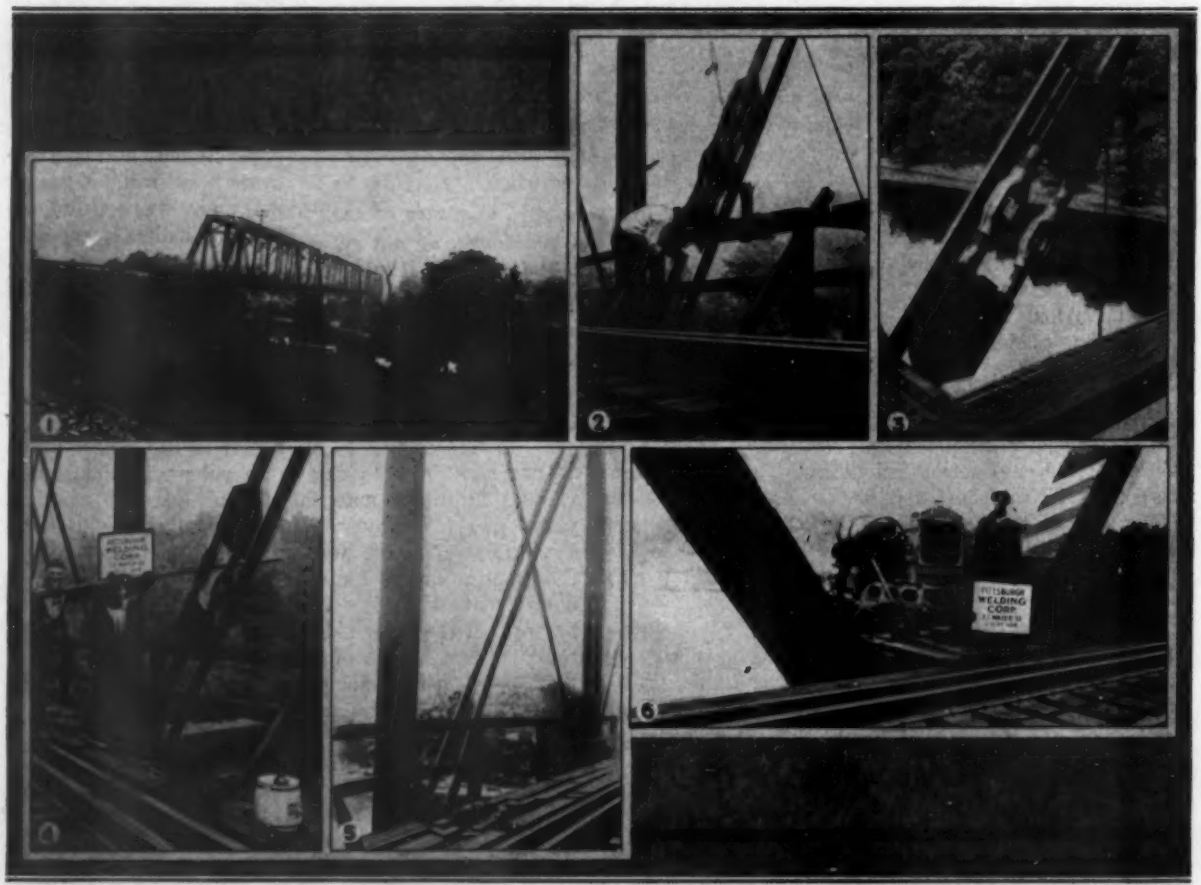
WHAT ARE EFFICIENCY AND ECONOMY?

To a certain extent efficiency and economy have a very different meaning under different circumstances. About eight years ago under the direction of L. C. Herrick, then highway director of Ohio, I was building by force account a 12¾-mile section of the C.C.C. Highway. The section involved heavy grading, numerous bridges, long hauls and was a very high type of pavement. Four-inch brick was used with asphalt filler on a 5½-inch reinforced concrete base. When the job was about 75 per cent finished, a great hue and cry was made that the work was very inefficiently carried on, materials wasted, men loafing, etc. In fact, the Legislature and the Governor took serious notice of this and an investigating committee was appointed and things generally made unpleasant for the men in charge.

A few months later when the work was completed and all bills paid, and a group of special auditors had gone over all the accounts, it was found that there was a saving of $104,000 below the engineer's estimate, which accrued to the state. The work was built in record time, of a quality that has never been questioned, and a large saving was made. Was the job carried on efficiently or was it not? There was waste, there was idleness, there was, to some extent, mismanagement, but a good job was completed in record time and money saved.

ACKNOWLEDGMENT.—Prepared from a paper read before the American Road Builders Association.

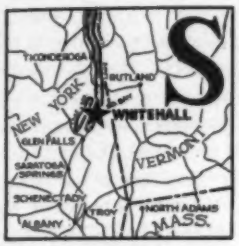
Steps in Repairing a Railroad Bridge by Arc Welding



1. General view of the pin and link type three span, through-truss railroad bridge over the Kiskiminetas River near Pittsburgh, Pa., which was successfully repaired by welding. 2. The welder at work. Some of the eyebar diagonals in each span had become elongated by wear and vibration. The inactive members were drawn up to carry their full share of the dead and live load stresses. These loads were hitherto carried by the adjoining diagonals which were probably overloaded. 3. Close-up of the welded tightening device known as the "Pittsweld" device. It consists of two turnbuckles welded to plates attached to the inactive bar, drawn tight with clamps and permanently attached by welding. 4. Testing the tightening device after welding. The work was done by the Pittsburgh Welding Corp. The test consisted of drawing up each turnbuckle with a 15-foot lever while the weld was subjected to heavy blows. 5. A Pittsweld device in the floor of the bridge. 6. The General Electric gas-engine driving welding set which furnished power for this job.

Rock Fill and Foundations for Highway Bridge

Huge Rock Blast for Fill Blocks State Highway When 90-Foot Cliff Face Is Shattered at City of Whitehall, N. Y.



SIXTY thousand yards of rock were moved at one blast from a 90-foot face to furnish the rock fill for the new state highway bridge across the South Bay of Lake Champlain at Whitehall, N. Y. A rock fill 1,800 feet in length is to be built with a top width sufficient for a 30-foot highway. The bridge is to have a 35-foot 9-inch bascule draw span and a 102-foot 6-inch plate girder span requiring the sinking of three cribs.

The Rock Blast

A 90-foot face of rock about ½ mile from the east end of the bridge and between the bridge and the city of Whitehall will furnish all the rock for the fill and cribs. The work of cross sectioning this cliff to determine the amount of rock taken out for the fill by the contractor, O. Donohue, Kingston, N. Y., was no mean task. Inasmuch as at least one-third of the fill will be in mud, and hence impossible to measure, the rock had to be measured in place.

About 40 days were spent in preparing for the blast in driving the two 50-foot tunnels and the side tunnels and pockets. The pockets, measuring about 5 x 10 x 5 feet, were packed with 25 tons of Atlas black powder and three sticks of dynamite with caps in each pocket. The entire charge was blown at once at 9 A. M. on June 9 by a battery. The accompanying diagram shows the layout for the blast, and the illustrations, furnished through the courtesy of M. H. Bingham, engineer in charge for the New York State Department of Public Works, shows the before and after conditions at the site of the big blast.

The 60,000 yards of stone was thrown out over a section of the state highway shutting off traffic for 9 hours. The city of Whitehall was placed in a difficult position by having its main supply of water cut off by the damaging of a main. For 4 days the city had to depend on the water in the old reservoir in the city until a 14-inch Universal cast iron pipe line was laid to replenish the supply. Just after the reservoir was filled again the line broke and again cut off the city from its source of supply. This break was quickly repaired.

Most of the rock thrown out by the blast was of a size easily handled by the Northwest 1-yard shovel, but could have been handled more easily by a larger machine. Any pieces too large for the shovel were mud-capped and broken up by small charges of dynamite.

The 1,300-Foot Fill

Work started immediately on the rock fill after the blast, using a fleet of International trucks dumping from the shore and working out to the point where the mud began and where the use of mattresses for uniform bearing in the mud was necessary.

The mattresses were made up of 8 to 10-inch logs of varying lengths laced with ¼-inch cable under and over and slabbed with pine slabs to keep the rock from falling through, and covered with brush to keep the mud from forcing up into the rock fill, thus causing more settlement and more rock fill. These mattresses were floated into position as needed ahead of the fill, loaded and sunk.

Cribbing

Three cribs were needed for the bascule and the 90-foot deck girder. These were built up near the east end of the bridge of 8-inch logs for a base and slabbed with 8-inch logs. The bottom and slab sections were drilled

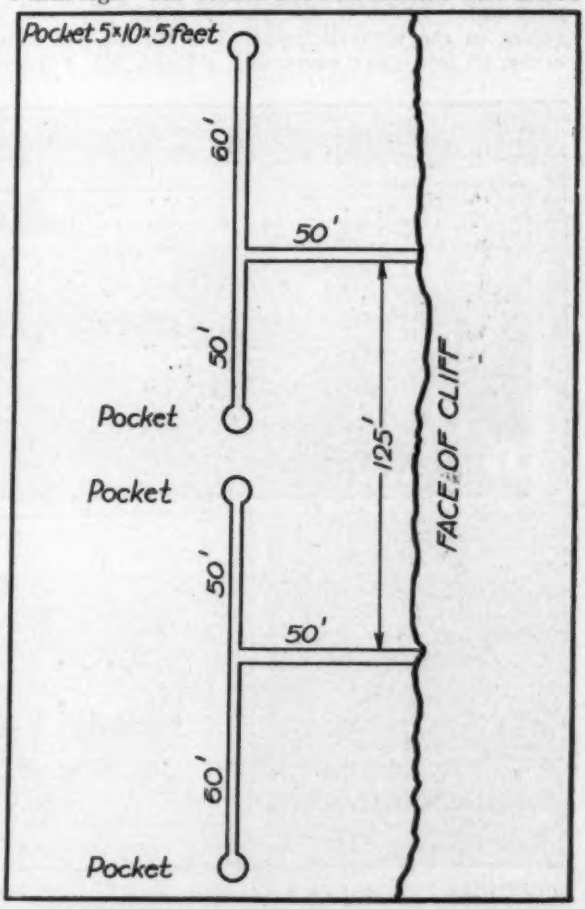


Diagram Showing Layout of the Tunnels and Pockets for the Blast at Whitehall, N. Y., Using 25 Tons of Atlas Black Powder

View of the Blast Showing the Highway Completely Blocked and Automobiles Gathered on Rock in Roadway

and doweled for strength and then cribbed for 13 feet with the 8-inch logs. These were set over the pile foundation already in place and sunk with rock fill. When sunk in position the cribs were slabbed on top and concrete poured 4 feet under water on them for the concrete abutment.

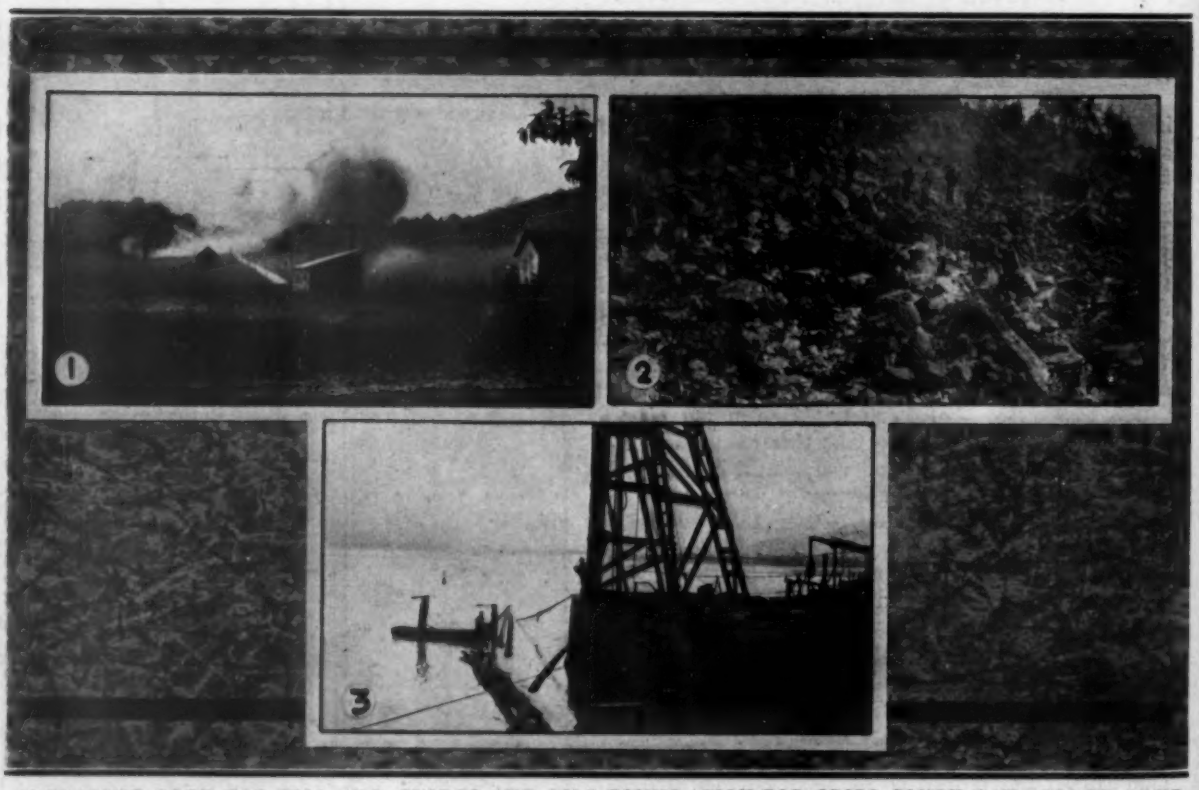
PILE DRIVING

Pile driving operations were carried on night and day and the fill pushed ahead 7 days a week. On the east abutment 120 piles and 7 guides were driven, 72 piles and 6 guides on the pier, and 207 piles and 9 guides on the west abutment. The 60-foot pile were driven 20 feet under water with a Union No. 2 steam hammer and a 20-foot follower. The first 20 feet of driving was through clay, then 40 feet of hard pan. It is reported by some of the "oldest inhabitants" that on the old structure that is still serving traffic awaiting the completion of the new bridge, 90-foot piles were used, and that they were driven practically the entire length through quite soft mud. Such are the memories of the old-timers.

PERSONNEL

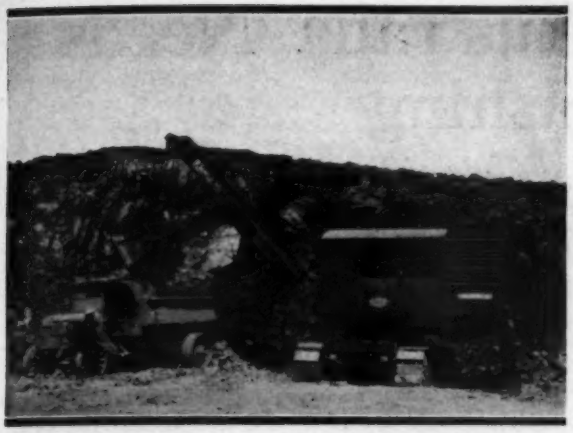
Scott Bros. Construction Co., Inc., Rome, N. Y., were the general contractors for the bridge, with most of the work sublet to contractors specializing in various fields. These included C. Donohue, Kingston, N. Y., who did the rock blasting and hauling, the approach grading and gravel road over the rock fill; J. Doyle, Hudson Falls, N. Y., who drove the piles, built and sank the cribs and did the concrete work on the abutments; Brockett Lumber Co., Johnsonville, N. Y., who furnished the piles and cribbing material; G. Homborg and C. Hammer, Washington, D. C., who did the rock tunneling and had charge of the powder work, and B. Vedder, Johnstown, N. Y., who furnished trucks for the rock fill.

The contract for the fill bridge and bascule was awarded to Scott Bros., on March 22 for $256,484.50. A total of 200 working days was allowed for completion of the structure for traffic. The work was let by the New York State Department of Public Works, and is under the direction of Perry Filkin, District Engineer, with M. H. Bingham as Engineer in Charge.



PREPARING ROCK FOR FILL AND GUIDES AND PILE FOUNDATION FOR CRIBS, SOUTH BAY BRIDGE, LAKE CHAMPLAIN, AT WHITEHALL, N. Y.

1. The big blast at the instant it was fired. 2. A close-up of the rock after blasting. 3. Union steam pile driver preparing to drive a 60-foot wood pile for the crib foundation



One of H. W. Rohl's P & H-700 Shovels Working on the Puddingstone Dam Near San Dimas, Calif.

Savings in Gas Operated Machines on Puddingstone Dam Job

H. W. ROHL & CO., general contractors, Los Angeles, Calif., has done a good deal of work for the Los Angeles County Flood Control Commission and has recently completed work on the Puddingstone Dam, a unit of the County Flood Prevention Works near Los Angeles. This company has proved to its satisfaction that gas-operated machines have many advantages over steam shovels on its work. It is stated by Ben F. Wells, construction superintendent for H. W. Rohl & Co., that the elimination of water tenders and coal handlers is worth between $1,000 and $2,000 per year in labor cost alone. Furthermore, it is much more convenient to move a gasoline shovel from one part of a job to another because no provision need be made to transport the water and fuel supply with it. Another feature particularly valuable in a dry country with much brush and some timber land is that there is no fire hazard with the gasoline-driven machine.

On the Puddingstone job a ¾-yard crawler-type unit was used for road building and also for stripping. Its work was largely of a preliminary nature. A 1¼-yard machine of the same make was used with a 1½-yard bucket. This machine made a very good record in a borrow pit operation near to Puddingstone Dam.

The main borrow pit used in connection with the Puddingstone Dam had a 500-foot face about 40 feet high. This pit yielded a clayey dirt with a very small percentage of rock. Dirt taken from the face of the borrow pit was loaded by the two shovels into a fleet of 14 5-ton Sterling trucks and carried to the dam on an average haul of about 1,000 feet. The work was carried on for 77 consecutive days of 16 hours each. Each shovel had one operator and one pit man on each of two 8-hour shifts. The shovels worked for 154 shifts or 1,232 hours.

The net output, taking account of all lost time, was 1,300 yards per 8-hour shift for the 1½-yard machine. On one occasion, when there were no delays in the trucking schedule, this unit handled 1,800 yards in 7 2/3 hours.

Shovel maintenance on the Puddingstone job was in the hands of the camp repair man and one helper. This crew also looked after trucks and all other mechanical equipment. The shovel operator used on the second shift was sometimes called upon for minor repairs and maintenance work.

The entire repair costs on the P & H machine during the Puddingstone job was about $250, including one overhaul job. The daily operating cost for the 1½-yard machine, including fixed charges, gasoline, oil, grease and operating labor, were $75.23 for a 2-shift day of 16 hours.

Are Contractors Superstitious?

HUMAN beings are about all the same, whether they are contractors, college professors, day laborers or bank presidents. At least, four out of five people interrogated will deny that they are superstititous in any way, but the next moment will go out of their way to pick up a pin or to dodge walking under a ladder.

On a recent trip three interesting instances of superstition among contractors came to the Editor's attention. On one job trouble had developed with a low subgrade and the cable on the paver skip had broken, causing a total delay of nearly two hours of paving, just before lunch time. The superintendent admitted that he wasn't surprised that he was having so much trouble that day as it was the thirteenth day of concreting.

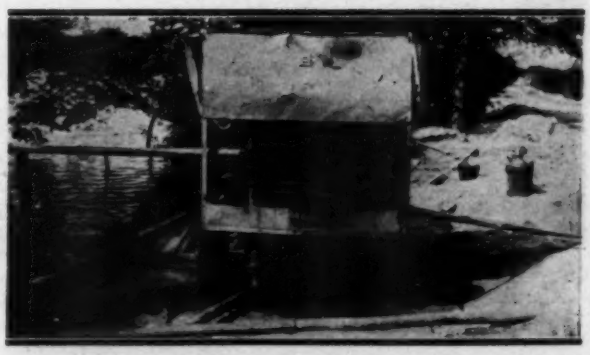
On another job nearby it was noted that the trucks as they approached the paver each bore a large identifying number, the highest being fifteen. The superintendent informed us that we had seen the entire fleet of fourteen trucks and that none were laid up that day. It turned out that there was no truck numbered thirteen.

The state engineer in charge of another job told us the following yarn about an energetic Italian contractor who came to him one Thursday afternoon and asked if he would please set the stakes for a culvert about two miles distant at once. The engineer said that it was too late in the afternoon to set the stakes and that he would gladly do it the first thing in the morning. The contractor urged him to do it at once even if it was only to show the approximate location of the culvert. When asked why his request was so urgent, the contractor replied that he wanted to start work on that culvert before Friday, even to the removal of but a few shovelfuls of earth, so that he wouldn't have trouble by starting on Friday.

Supplying Water on a 5.59-Mile Road Job

ON its Reconstruction Contract 1774 on Jericho Turnpike, the Riteway Construction Corp., of New York, had to supply water up grade for over 2½ miles of the job. The 2½-inch pipe laid along the shoulder supplied water both for the paver as it progressed and for sprinkling the hay used in curing the 10-foot concrete strips.

The layout at the lake which supplied all of the water consisted of a Barnes Triplex pump powered with a LeRoi engine and a Domestic pump with a 4-horsepower, 2-cylinder engine, with a valve between the two. The Barnes pump which ran up a pressure as high as 340 pounds was used in pumping on the long uphill leg and when the 2½-mile leg only required water the valve was closed and the Domestic pump was used with a pump pressure of about 200 pounds. When water was being used on both legs with the paver operating and a long stretch of concrete being sprinkled both pumps were thrown into operation on the line.



Barnes Triplex Operating at 340 Pounds Pressure on 2½-Inch Line Supplying Water for Paver and Curing

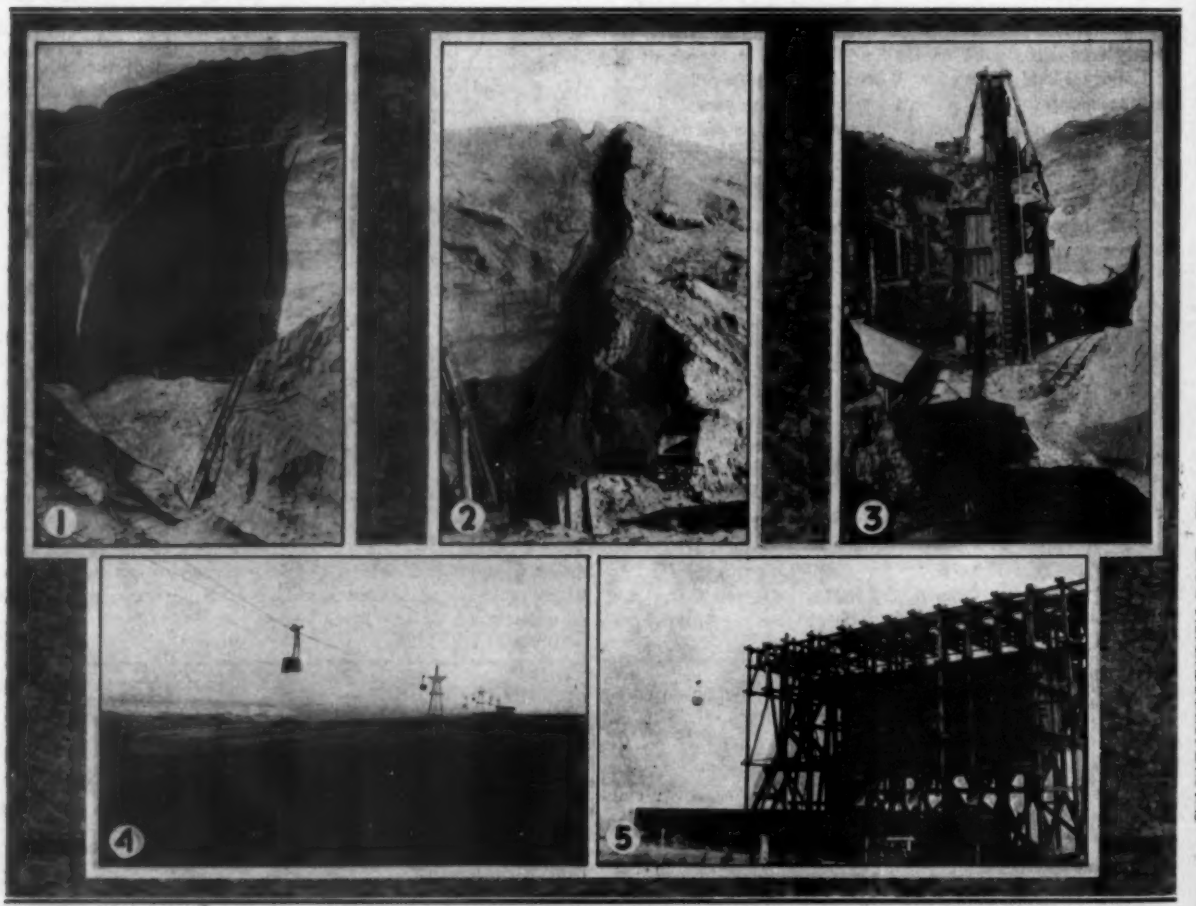
Ideal Sand In Australia Needs No Washing

Ancient River Bed the Site of Large and Unusual Sand Plant of the Noarlunga Sand Co., Ltd.

AN unusual deposit of extremely evenly graded and uniform sand is the site of a sand plant owned and operated by the Noarlunga Sand Co., Ltd., Adelaide, South Australia. The deposit, located about 20 miles south of Adelaide, is an ancient river bed, about three-quarters of a mile wide, and having no connection with the recent sands along the coast. Owing to its age, the sand is free from all organic matter, contains a very small quantity of gravel, and is practically all quartz grains. It is very uniform and ideal for concrete and other building purposes.

The plant of the Noarlunga Sand Co., Ltd., was designed by the company's consulting engineer, J. J. Grierson, who was also responsible for its construction and the installation of all the equipment. The plant, because of the cleanness and evenness of the sand, includes no provision for washing or screening and the operation consists of dragging the sand from the pit to a storage bin feeding an aerial ropeway by which the material is carried to a loading bin on the railroad. Most of the product is shipped to Adelaide, for local construction work.

The deposit is covered with an overburden varying



DRAGGING IN AND TRANSPORTING SAND AT ADELAIDE, SOUTH AUSTRALIA

1. Opening sand pit preparatory to installing the tramway loading plant. 2. Excavating sand from the face of the pit with a ¾-yard Crescent scraper. The scraper works on a span of 500 feet and it is planned to excavate from this set-up all of the material within a 500-foot radius of the plant. 3. The scraper delivers the sand to a hopper feeding a bucket elevator which raises the material to the bins. Later the sand is loaded from the bins into buckets on an aerial tramway and carried to the railroad loading plant 1¾ miles away. 4. The aerial ropeway. 5. The railroad loading plant where sand received via the ropeway is loaded into gondola cars

from nothing up to 8 feet. Below that the height of the face of the sand varies from 50 to about 80 feet. The loading bin for the aerial tramway is set on the floor of the pit, in an excavation in the middle of the deposit and the sand is dragged down from the surrounding banks to this hopper. The excavator used is a Sauerman Crescent ¾-cubic yard power drag scraper, with an electric scraper power unit. The machine is installed on a span of 500 feet, and from the present setting of the plant it is intended to excavate an area within a 500-foot radius on all sides of the loading bin. The capacity of the plant is 45 tons an hour.

The power scraper discharges into the boot of the bucket elevator which lifts the sand to the loading bin of 100 tons storage capacity. The discharge gates of this bin feed the sand direct into buckets on the loading terminal of the aerial tramway which in turn carries the sand to the railroad loading station 1¾ miles away. The buckets on the tramway rise up a 25 per cent grade and pass around an automatic angle station, then over undulating country to the railroad bin. The buckets tip automatically, and return to their loading stations upside down.

The loading bin at the railroad has a storage capacity of 400 tons, and is equipped with gates on one side for the loading of 40-ton gondola cars, and gates on the other side for loading motor trucks. The company's railway siding is so graded that all of the shunting of cars is carried out with a standard Fordson tractor. Only one man is employed at this end, and he does all of the spotting and shunting of cars, loading, consigning and so forth. A gondola car canoe loaded in approximately five minutes.

The sand deposit is opening up well, and there is an excellent market for the product. The plant layout seems to be very efficient and is working to the entire satisfaction of the company's officials.

Law Suit Threatens the Water Supply

A PAVER without water is as helpless as a ship without the sea. In a middle west state on a paving project which was going along quite well in spite of some difficulties over the fill the contractor was worrying a bit over the water supply for the paver on one section of the work. To be sure, he could pump from a distance but it would be much better to reduce the pump pressure by using a supply nearer the paver.

A very satisfactory supply was found in a small brook which ran through the property of a citizen of foreign ancestry. The stream was apparently not used for any useful purpose by any of the owners of property either upstream or downstream. So a small earth dam was thrown up and a pool of water formed from which water was drawn by a pump very carefully set so as not to injure one blade of grass on the adjacent property.

After about a week the lessee of the property threatened suit and asked immediate damages of $1,000. He sought a lawyer and took him out to the site of the trouble, telling him that his chickens and ducks were deprived of water by the reckless appropriation of the brook by the contractor. When the lawyer looked over the property he failed to find any chickens or ducks and called this to the attention of his client. The quick response was, "Of course I have no chicken and duck, but I want some and I have no water for him. Me want damage from contractor."

HANDLING EXCAVATION AND FILL ON THE NEW UNIVERSITY OF CALIFORNIA ATHLETIC FIELD IN BERKELEY

Ariss-Knapp Co., California excavation contractors, used two Caterpillar Sixtys with bulldozers, a fleet of trucks and an Erie shovel to handle this work

Investigation of Accidents

THE matter of accident prevention has now passed the first stage where everyone is trying to sell to every one else the idea of accident prevention and trying to work up some enthusiasm on the part of the workers for such a movement. It is no longer necessary to persuade people of the urgency of the cause. The problem now is to teach people how to go about the actual prevention of accidents. In this the first step seems to be an investigation of accidents which have already occurred, their cause, results and so forth in order that a repetition of such an accident may be avoided.

The National Safety Council, 108 East Ohio Street, Chicago, Ill., has made a study of this subject and has recently issued another in their series of Safe Practices pamphlets entitled "Investigation of Accidents," which discusses the importance of investigation in a campaign of accident prevention. According to this pamphlet, successful accident prevention work must be based on actual accident experience. The executive or safety man who is starting safety work in an industry is often told, "We have no accidents here." And then his first task is to search through the files and uncover accidents which have been forgotten.

The principal purposes of an accident investigation are to ascertain the cause or causes so that measures may be taken to prevent similar accidents and to secure publicity among the workmen and their supervisors for the particular hazard and for accident prevention in general by directing attention to this accident, its causes and results.

Accidents causing death or other serious injury should obviously be investigated. The near accident that might have caused death or serious injury is equally important from the safety standpoint. The breaking of a crane hook or a scaffold rope or the explosion of a tank are accidents whether any one was hurt or not and should be carefully investigated.

Any epidemic of accidents demands study. A particle of emery in the eye, or a scratch from handling sheet metal, is a very simple sort of accident. The immediate cause is obvious but if accidents of this or any other type occur frequently in the plant or in any one department an investigation should be made to determine the underlying causes. Generally such an investigation is not public, but will be a careful study by the superintendent or by the safety department of all contributing factors, both mechanical and personal. The chief value of such an investigation lies in the uncovering of contributory causes. The energetic safety engineer or manager is constantly alive to the advantage of this kind of accident investigation which may prove more valuable, though less spectacular than the inquest following a fatal injury.

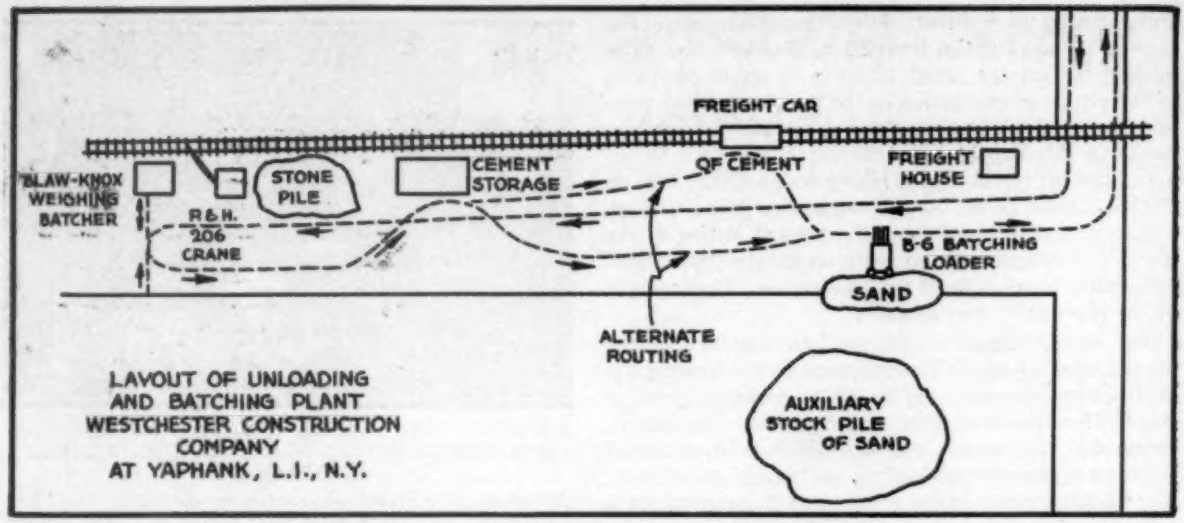


Diagram of Layout of Unloading Plant at Yaphank Station

A Well Planned Unloading Plant

THE Westchester Construction Co., Yonkers, N. Y., is contractor for a stretch of 4.85 miles of 30-foot reinforced concrete pavement between Patchogue and Moriches, Long Island, New York. An interesting layout was devised to handle the unloading and batching of stone and sand.

As shown in the accompanying illustration, trucks entered from a secondary highway, turning right about the freight house and continuing to the far end of the yard where they backed under a Blaw-Knox weighing batcher to receive the sand. From this, they went either to the cement storage house or to a freight car on the siding where the cement was emptied onto the batch. The trucks then went to the Barber-Greene batching loader and continued out onto the highway again. The stone and cement were received by railway, the stone being unloaded to stock piles or to the bins by a P & H 206 crane as required. Any over supply of cement beyond current needs was stored in the cement house to save demurrage.

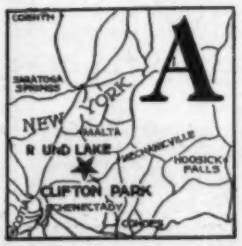
The handling of sand was one of the most interesting features of this unloading plant. An auxiliary stock pile was maintained in an open field north of the yard, while sand for current purposes was hauled 2½ miles from a local sand pit by a fleet of three trucks and delivered close by the batching loader. New York State specifications require that aggregates shall not be dumped on the ground, but shall be stored on planks or other suitable platforms to prevent dirt mixing with the aggregate. A fleet of 14 trucks was used to haul the batches from the unloading plant to the job.

PLANT LAYOUT AT YAPHANK STATION

Left: P & H 206 crane handling stone to Blaw-Knox bin. Right: Barber-Greene batch loader delivering sand on top of stone and cement from roadside. In background at left is seen the surplus stock of sand

Attention to Details Makes This Job Run Smoothly

S. A. Scullen, Inc., Cohoes, N. Y., Has Novel Devices Which Simplify Batching Cement and Protect Subgrade at Paver



ABILITY to make the best of every situation and to devise new equipment to facilitate the operation of the job is the function of the progressive superintendent on a construction project. S. C. Scullen is acting as his own superintendent on the Clifton Park-Round Lake Contract No. 1795 for 6.3 miles of 30-foot concrete between the two New York State villages named above, and he has developed several ingenious aids.

Rough Grading

The 180,000 cubic yards of unclassified excavation, which did not include any rock work, was handled by 3 Koehring shovels and 3 Insley shovels. All of the excavation went into fill and there was no borrow. On fill the fleet of dual pneumatic Autocars dumped where spotted and the spoil was spread by a Caterpillar with a La Plant-Choate bulldozer.

Fine Grade and Form Setting

A Rome high-lift grader was used very successfully in all the fine grading and preparing the grade for Truscon steel forms. A gang of 8 men and a foreman with the grader handled the fine grade with an additional crew of 15 laborers on the final grade touching up with hand shovels. The final grade was rolled with a Good Roads Senior gas roller. Mr. Scullen is developing a new fine grader with a rotating cutting bar that has been used successfully in trials on his work. The second machine is now being assembled.

Unloading and Batching Plant

The unloading and batching plant is located on a freight siding at Ushers, N. Y., about ¼ mile from the mid-point of the job. Gravel and sand are received in hopper-bottom cars by rail and spotted over a concrete pit with a steep slope away from the tracks. A Koehring crane with a Blaw-Knox 1-yard bucket grabs the material in the pit and discharges it to the stockpiles on either side of the crane or to the Blaw-Knox batcher plant immediately behind the crane. This makes a very compact unloading plant occupying the minimum of space. The trucks back under the batcher to receive the sand and stone and then pull out to run to the cement shed about ¼-mile distant. The unloading crew consists of two men in the car, the crane operator and the batcher man.

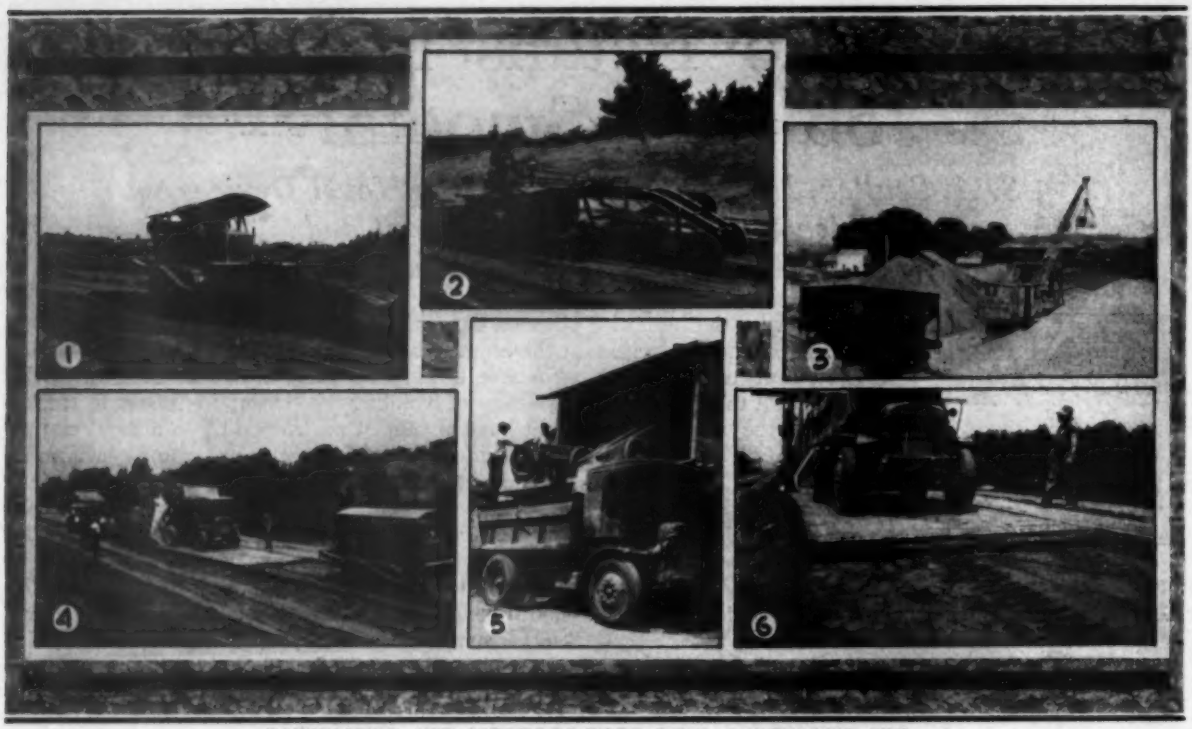
The cement shed has a capacity of about two carloads of cement. The cement is hauled by truck from the railroad siding. Helderberg cement is used. The only place on the entire job where there was any delay was at the cement shed where the crew of four men did not seem able to keep up with the trucks in spite of the novel way of handling the cement from bags to trucks. Eight bags of cement are emptied into a hand cart or trough and then the trough run out onto a platform at one end of the building over the trucks. A canvas funnel with an iron hoop sewed into the end of it is thrown out from the end of the trough onto the truck and the trough emptied by tipping. The cement runs out freely and spreads quickly over the top of the batch. The hand trough is made of sheet metal and measures about 8 feet long and 2 feet wide. It is mounted on Chevrolet axles with artillery wheels and pneumatic tires. At the end is a double leg of strap metal similar to those used on heavy wheelbarrows.

Trucks and Subgrade Protected at the Paver

It is quite common for contractors to protect the trucks from damage caused by running off the concrete onto the subgrade by using a short ramp placed close to the slab. Mr. Scullen has devised another method which not only saves the subgrade but actually makes it better, saves the tires of the trucks and eliminates all chance of broken springs. A platform measuring roughly 10 x 30 feet is made up of heavy planks and shod with sheet iron. This platform is placed between the forms or between the form and the concrete strip on which the trucks are running and is built about a half inch less in thickness than the height of the forms. It has a wedge-shaped nose and is pulled by a wire cable and a Caterpillar tractor. The tractor used is one which had been employed on the fine grading and had a bulldozer attached. The grousers of the tractor cut the subgrade slightly but when the platform had been pulled ahead over the subgrade there was no sight of the grouser marks and grade was planed perfectly smooth. Another advantage of the platform is that when the skip has dropped onto it to receive its batch and any of the batch is spilled it can be retrieved at once and without any chance of mixing any of the subgrade soil with it.

Concreting Crew

The organization of the men at the mixer is also somewhat unusual. One man bosses the trucks on and off the platform but he does not have to dump them as the fleet of 6 to 12 Autocars with dual pneumatic tires is equipped with automatic tail gates which release the first batch as soon as the body is raised. The second batch is released by the truck driver. The truck boss also watches the water hose for the paver which is supported over the concrete by an arm extending out about 12 feet. Two men work on the subgrade behind the mixer and make any last-minute adjustments shown



EQUIPMENT AND METHODS USED BY S. A. SCULLEN, INC.

1. Caterpillar Thirty with LaPlant-Choate bulldozer on grading. 2. Rome high lift grader on fine grading. 3. Unloading and batching plant at Ushers, N. Y., showing men shovelling stone into pit, sand pile, Koehring crane with Blaw-Knox bucket unloading sand from the pit to the Blaw-Knox batcher plant, with sand stockpile at extreme right. 4. Paving plant, showing Caterpillar Thirty ready to move truck platform. Autocar dumping batch into skip of Koehring 27-E paver and at extreme left the Lakewood mechanical screed. 5. Autocar with two batches of aggregate receiving cement from trough in front batch and man just removing canvas chute with iron ring from trough preparatory to dumping the cement on the second batch. 6. Detail of the truck platform

necessary by the scratch board. One of these men is called on as required to help move the water hose. There is one operator for the Koehring 27-E paver and one for the Lakewood screed. A hand-operated screed is used by two of the shovel gang of 5 men to roughly level the concrete 2 inches below the top of the forms to receive the fabric reinforcing. There are no spaders as each of the shovel gang is required to take his turn at the forms and to turn his shovel to insure a slight excess of grout at the form to prevent honeycombing. Two men shovel in front of the Lakewood screed, and a crew of 3 men handle the 10-foot straight edge, hand-finishing the edge and joints and making the brush-mark finish required by New York State specifications to insure a good grip for automobile tires and thus reduce skidding on concrete to a minimum. In addition to the belt of the Lakewood screed the contractor is using two men on a thin cypress board with a canvas face in the final finish.

One man is used all the time to spread the burlap over the new concrete and two men are used to spread the hay on the previous day's run and to sprinkle for 10 days.

With the 8-bag batch on June 17 a run of 1,798 feet of 8-inch, 10-foot slab was laid, the paver producing a total of 427 cubic yards of concrete.

The new Johns-Manville asphaltic expansion joint is used on this job.

PERSONNEL

This project known as Clifton Park-Round Lake Contract No. 1795, is 6.3 miles in length and 30 feet wide. The contract was awarded to S. A. Scullen, Inc., Cohoes, N. Y., of which S. A. Scullen is President and Treasurer, F. B. Scullen, Secretary, and H. A. Tessier, Assistant Treasurer. The work is under the direction of Perry Filkin, District Engineer, New York State Department of Public Works, with E. G. VanderWerken, as engineer in charge.

A New Safety Bulletin

IN accordance with its general plan of safety education for all of the elements in the building industry, the Committee on Accident Prevention of the Building Trades Employers' Association, New York, has issued its sixth safety bulletin, entitled "A Plan Which Will Reduce Construction Accidents." This plan describes a practical and simple method of safety which any contractor may use.

There is no hard and fast rule to insure safety on a building construction job. Such accident prevention is a mixture of theory, experience and hard-headed practical common sense. The average contractor almost always wishes to have things properly built and properly safeguarded, but what he lacks generally is organized control of the accident situation and a knowledge of how to go about it to accomplish results. The answer is that he should organize his work before the job starts. If he would put as much thought into planning safety work as he puts on the rest of the job, accidents would not be so frequent. The bulletin is prepared to help the contractor to make such plans and carry them out efficiently.

Copies of this bulletin may be secured gratis from the Committee on Accident Prevention, Building Trades Employers' Association, 2 Park Avenue, New York.

Truck Crane Demolishes Six-Story Building

THIS title sounds like a big accident, but it refers to the unusual use of equipment and rare engineering ingenuity on the part of A. W. Bowie, Inc., Binghamton, N. Y., in wrecking the 6-story Phelps Building built in 1863. The contractor used a Universal crane mounted on a Mack truck chassis. The Phelps Building was a 6-story wall-bearing structure with stone exterior walls but with few interior bearing walls. There were approximately 1,700 tons of face stone in the building.

The unusual feature of this job was the means employed to handle the heavy face stone which had to be removed and loaded into trucks standing at the curb. This required some kind of crane or derrick equipment. A. W. Bowie first considered the use of a stiff-leg derrick, but found that this meant spotting trucks for loading at one place which was an impossible condition due to traffic.

After carefully sizing up the situation, a timber platform about 20 feet high was built above the sidewalk and the crane placed on it. First, the crane erected two bays of a trestle on Chenango Street and was run up onto them by means of a 60-foot ramp. One of the accompanying photographs shows how the crane went up under its own power by using a system of double snatch blocks reeved up with the crane hoist line. As an added safety factor, a 1¼-inch manila rope was used, run around the crane winches.

From this position, as the work progressed, the crane built additional bays for the trestle as required, until it enclosed the outer perimeter of the building. The total cost of erecting the sidewalk bridge was about $1,200. The bridge, however, is an essential part of the falsework in constructing the new First National Bank Building which will replace the old structure. The only additional expense required was to make it heavy enough to support the crane. Mr. Bowie estimates the additional expense as between $400 and $500, chargeable to the crane method of demolition.

From its position on the trestle, the crane, equipped with a 65-foot boom, handled all stones directly from their positions in the walls into trucks at the sidewalk. It traveled back and forth on the trestle as necessary to most efficiently handle the work, resembling a locomotive crane in its flexibility of operation. Flooring, floor joints, steel beams and miscellaneous bulky material were also lowered to the ground in this manner. All doors, trim, radiators and miscellaneous fittings and fixtures were stripped from each floor in advance and lowered through elevators and stairways to the interior of the building. As the work progressed brick, plaster, lath and similar materials were wheelbarrowed to chutes and discharged on the outside of the trestle into trucks at the street level.

The Phelps Building was erected as a bank and contained a series of brick vaults, extending from the basement to the fourth floor. They were built 60 years ago of soft brick and lime mortar and proved a hard proposition to handle, as they resisted the best efforts of bars and pavement breakers. Light dynamite charges finally were resorted to with succcss. The vault doors and other heavy portions were handled from each floor to trucks by the crane.

Universal Crane with Extension Boom Handling Facing Stone as It Moves Along Runway Over Sidewalk. The Insert Shows the Crane Going Up the Ramp onto Its Runway

Handling Heavy Loads in Subway Construction

By Herbert M. Hale

Managing Engineer, The Marcus Contracting Co., Inc.

IN the construction of subways in New York City, no subway section has presented to the engineers of the Board of Transportation more problems in layout and design than has the Nassau Street Loop, starting from beneath the Municipal Building, passing between the World Building and the Lexington Avenue Subway, and extending on through Nassau Street and Broad Street to South Ferry. No section of this same subway has given to the contractor more obstacles to be surmounted in his operations than has that portion in Park Row in the vicinity of the Brooklyn Bridge.

Here in a short stretch of 200 feet there are 26 columns supporting both the elevated railroad and the approach structure to the bridge, 65 columns supporting the roof of a fan-shaped underground connection between the bridge and the Municipal Building, an underpassage crossing Park Row to the subway express station, and walls of old cyclopean masonry 10 feet thick carrying arches beneath the bridge approach, all of which must be temporarily supported and finally made to rest in the finished subway roof.

The illustrations here shown indicate the final stage in the temporary supporting of one of the Third Avenue Elevated columns in Park Row beneath a double-deck station, requiring provision for the maintenance of 275 tons of dead and live load per column.

Problems of Subgrade

The foundations of some of the columns were solid concrete pedestals of the stepped type which, at about 25 feet below the street, were about 10 feet square, all bearing on sand. Subgrade for the new subway was designed to about 15 feet below the column footings. Thus the required depth to subgrade necessitated the building of a full-size extension to the original footing down through the sand to subgrade level in advance of general excavation by means of a series of concreted pits under the pedestal. This done and excavation for the subway subsequently completed, as much of the new structure as possible was built on either side, leaving out necessarily the one or two steel bents with which the concrete foundation for the column interfered. Here the second stage of temporarily supporting the column load at a point above the subway roof took place in order to remove the necessary portion of the footing in interference with the subway steel in the same location.

The first illustration shows the ends of three major 30-inch Bethlehem pick-up beams passing through the concrete pedestal, while immediately below them is the spanning beam supported at two ends in the completed subway roof. The duplicate of this arrangement maintained in the opposite side of the column. Intermediate posting under the spanning beam was likewise carried up from below.

Setting the Beams

By carefully drilling line holes from the opposite sides of the concrete pedestal and removing the interior concrete, a hole was created sufficiently large to admit the center 30-inch pick-up beam, which, when set to the proper elevation, was concreted into the hole and all space around the beam thoroughly grouted. In

View Looking East in Subway, Showing Apparatus in Place While Pre-Test Is in Operation

The Final Stage in the Temporary Supporting of One of the Columns of the Third Avenue Elevated

turn, each of the outside 30-inch beams was set and concreted into side notches cut in the pedestal concrete. Into a line of about twenty 2-inch holes shown in the second illustration, drilled through the pedestal below the pick-up beams, were placed a sufficient number of plug steel wedges on opposite sides of the structure for use in conjunction with the hydraulic jacks.

The lifting load required two hydraulic jacks of 3⅝-inch piston diameter for each end of the three Bethlehem pick-up beams or twelve jacks in all. Straddle beams, resting on the spanner beam and the underslung beam arrangement with hanging bolts provided bearing seats for four jacks in two groups, with one behind the other, acting directly under the two right-hand Bethlehem beams. Two jacks at the left reacted down against the finished subway roof. Hydraulic piping from all six jacks connecting to a common supply line attached to a single, hand-operated pressure pump completed the set up. A similar pump on the opposite side of the column footing supplied a duplicate arrangement of jacks acting on the other ends of the three Bethlehem beams.

COMPLETING THE UPLIFT

The application of pressure through the jacks, together with simultaneous follow-up blows on the plug wedges picked up the load and at the same cracked the concrete mass horizontally on the line of the drill holes. Check levels on the elevated column on the street surface and on the pick-up beams below, recorded the conditions of uplift until when about ¾-inch had been obtained, steel plate fillers shown at hand in the left of the first illustration were set in between the pick-up beams and the spanner beam. Settlement levels on the column were taken the following day as a check on all blocking and posting. Thus in the act of separating the column load from its original foundation, all the temporary carrying arrangements was automatically pre-tested in advance for the work it had to perform, while, in the event of any failure in the beams or posts during the process, the column load would still be carried as in the original condition on its own foundation. No damage then could be done to the elevated structure. This is a feature of the pre-test system of underpinning under which patent all foundation problems in connection with the Nassau Street Subway have been handled.

The next step remained then to remove all masonry of the footing below the horizontal crack developed through the line of holes, down to subgrade, erect the new subway roof steel in the same location and build up the roof concrete as a permanent contact support under the column footing at the plug and feather line.

PERSONNEL

This project of raising the elevated piers was carried out by the Marcus Contracting Co., Inc., New York, with Herbert M. Hale and G. P. Vulte in charge. D. C. Waite and W. F. Fox, maintenance engineers of the I. R. T., were on hand to represent that company, and the Board of Transportation was represented by its own engineers.

Effect of Finer Sizes of Gravel in Concrete Mix

SPECIFICATIONS for concrete often eliminate or rigidly restrict sizes of gravel which occur in considerable quantities in the source of supply, and consequently increase the cost of production and cause the more rapid depletion of the deposit. Studies are being carried out by the National Sand and Gravel Association for the purpose of determining the effect of variations in grading of gravel with the view to encouraging its use in the most economical manner.

Three investigations bearing on this question are now under way ,according to *The National Sand and Gravel Bulletin*. One of them has to do with variations in the quantities of the finer sizes, tests for which have been completed and the final report is now in preparation. Pending its publication it is of interest to note briefly certain of the results.

Compressive and transverse strength tests were carried out on several concrete proportions, in each of which the grading of the gravel was varied by adding different percentages of sizes retained between the No. 4 and ⅜-inch sieves and between No. 8 and No. 4 sieves. The gravel to which these sizes were added was graded from ⅜-inch to 1½ inches. The following results were discovered.

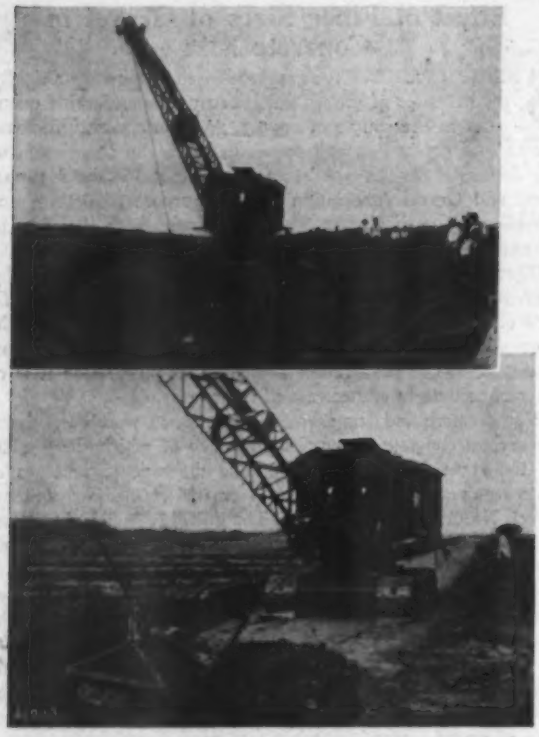
In general, the addition of the finer sizes of gravel caused a slight reduction in the strength of both the cylinders and the beams, but this was accompanied by a reduction in the quantity of concrete required to produce a given volume of concrete. For example, the 1:2:4 and the 1:2½:3¼ mixes were affected by the addition of different percentages of the No. 4 to ⅜-inch size of gravel.

These few tests bring out several important facts. It will be noted that the inclusion of the finer sizes caused a slight reduction in the strength, where the proportions of cement, sand and gravel were not changed. In other words, the use of a finer total aggregate required more mixing water, and consequently produced a lower strength. The tests also showed a reduction in the quantity of cement required per cubic yard of concrete with increases in the amount of the No. 4 to ⅜-inch gravel. This saving in cement and the decreased cost of the gravel, due to the inclusion of the finer sizes, would make the gravel with the higher percentages of the fine material more economical than that with lower percentages, even if no changes were made in the proportions. However, in order to realize the full economy of utilizing the finer sizes the quantity of sand should be reduced.

These tests illustrate what is generally recognized as true but is rarely taken into account in the proportioning of concrete on the job. It is that equivalent gradings may be obtained in a great many different ways, and that large variations in grading of gravel may be compensated for readily by relatively minor changes in the proportions of the sand. The most important function of the gravel producer is to furnish a material of dependable uniformity in grading, so that the most economical proportions may be selected intelligently.

In the Next Issue

The August issue of CONTRACTORS AND ENGINEERS MONTHLY *will contain interesting articles on the construction features of the huge playground project at Jones Beach, Long Island; a description of a central mixing plant layout in Canada; the building of 10.5 miles of mixed macadam in Ontario; a description of the construction and equipment used on the Lake Champlain Bridge at Crown Point, New York; the plant layout on the Montreal Power project and a large number of other unusual and helpful articles on construction jobs visited personally by the Editor on his 6,000-mile trip for the benefit of our readers.*



The Bucyrus-Erie 50-B Diesel Shovels Which Were Used for Excavation in the Orient

Modern Excavating Methods in the Far East

AN interesting piece of excavation is under way in Burma, the largest province of British India and located east of the Bay of Bengal. In this famous eastern land the Myitkyo Loop of the Sittang River, which is situated about 80 miles inland from Rangoon, has been silting up for many years until navigation has become seriously impeded, and the use of the Pegu Canal, with its entrance located at the Myitkyo, has been rendered increasingly difficult. To overcome this problem, it was decided to cut across a loop, diversifying two other streams into the Myitkyo Loop of the Sittang River near Myitkyo, and so bring fresh water into the Loop to keep it open.

From June until October, this land is flooded and work can be done only between December and the end of May. Owing to the urgency of the matter it was essential to complete at least one of the cuts by the end of May. After a careful survey of the situation, it was decided to secure two 1½-yard Bucyrus-Erie 50-B diesel draglines. These had to be shipped from the United States and delivery was made in record time.

The job necessitated the excavation of about 540,000 cubic yards, including considerable material under water. J. Guthrie, erecting engineer in charge of the erection and operation of the machines, started the first machine on the job on January 28 and the second machine started February 5. During the first three weeks of operation, each of the draglines excavated over 50,000 cubic yards of material. Working three shifts a day, each made 13,000 cubic yards in excess of the total estimated production for an entire month.

The average cut was from 15 to 20 feet deep, about 10 feet bed width and 35 feet top width. In order to maintain as wide a berm as possible, the machines swung a full 90 degrees to their maximum dumping radius. The ground was uniform, soft digging, the bottom 4 to 6 feet being under water. At the rate at which the machines worked, not only the first cut but a large part of the second cut was completed before the floods arrived.

Demolition of First Skyscraper Shows How Steel Withstood Ravages of Time

PROOF that structural steel can successfully carry its designed loads and withstand deterioration through corrosion and other sources has been afforded by the careful analysis of the material which was removed from the Tacoma Building in Chicago. This was the first building of what is known as the skyscraper type of construction erected in the United States. It was a 13-story building erected in 1887 by the George A. Fuller Construction Co. In this type of construction the walls are supported on the steel framing and differs from other construction in that previously walls were self-supporting.

The engineering and architectural records pertaining to this building were practically all destroyed by fire so that the best present evidence of the materials of construction was secured through a careful analysis of the building during demolition. This disclosed the fact that the Tacoma Building had walls which were carried at each floor on steel spandrel beams attached to cast iron columns. According to authorities writing on the subject it was in this building that was first seen the startling spectacle of bricklayers starting to lay walls midway between roof and ground.

Evidence indicates that the framework of this building was originally designed to make use of either rolled or fabricated shapes or cast iron for all supporting columns. The cast iron columns used to bear the perpendicular load had a circular cross section. This shape provided efficient strength and rigidity. Some of the columns were cast with four rectangular ribs spaced 90 degrees apart. They were bolted together from end to end and were cast with brackets to which the beams were bolted.

The steel from this building has been subjected to chemical analysis, etching and microscopic examination. There was no evidence of deterioration in the crystalline structure and it is believed that the framework of this building would have been good for many years to come. Original location markings in paint were as fresh and bright as when the beams were first covered. The material in the webs of the beams as originally rolled was less than ¼-inch in thickness, yet was still perfect and capable of carrying their loads when the sections were removed.

The Evolution of the Wheelbarrow

Courtesy of Sterling Wheelbarrow Co.

The Prehistoric Wheelbarrow Was Truly a Back-breaker; Not So With Modern Well-balanced Barrows

LABOUR

Centrifugal Self-Priming PUMPS

Rendering an appreciated Service for E. J. Albrecht Contractor, Chicago.

OUR picture this month was photographed in Grant Park, near the Lake front, just about due east of the Stevens Hotel, Chicago.

It shows a LaBour Portable Centrifugal Self-priming pump lifting water from 1 foot below lake level to an embankment 25 feet *above* lake level, and through a 400 foot length of 3 inch linen hose.

Mr. P. W. Joy, Job Superintendent for E. J. Albrecht, contractor, said, "Our two LaBour pumps are doing excellent work, and we keep them busy practically all the time. You will be interested in one case where one of their pumps handled a

Straight 29 Foot Lift

"It was in a deep shaft of a Sanitary District diversion chamber, at Main Street and McCormick Road, west of Evanston. We attached 20 ft. of 4 in. suction hose to 12 ft. of 4 in. iron pipe, with foot valve. And, to our amazement, one day last July, we saw your pump actually handling a straight lift of 29 ft.—pumping sewage! And it quite regularly handled a 25 ft. lift in this work.

"Another instance: this same pump actually emptied 4 miles of 6 ft. 6 in. concrete sewer which was completely filled with sewage, in three days. This was the North Shore sewer of the Sanitary district, running from the Howard St. pumping plant to Wilmette. The water was pumped out of a manhole at an average lift of 25 ft."

CENTRIFUGAL SELF-PRIMING

A revolutionary type of pump, strongly patented, and exclusive with us. Once called a "freak," it is now the DOMINANT CONTRACTORS PUMP; in such widespread demand that we have had to move to a new plant three times our former producing capacity.

No floats or valves are used in LaBour pumps and no external priming devices. Our patented Impeller —the only moving part—together with the casing in which it operates, takes the place of all such complications.

LaBour pumps are offered in a range of sizes, for portable or stationary installations; from our own stocks, or by contractors supply huses.

Send for Bulletin 29-C

THE LaBOUR COMPANY, Elkhart, Indiana

Current Earthquake Proof Construction in Japan

The Yaesu Building in the Center of Tokio Which Was Recently Completed, Work on the Office Building of 7 Floors, 98-foot Height Limit, Was Started Early in 1927

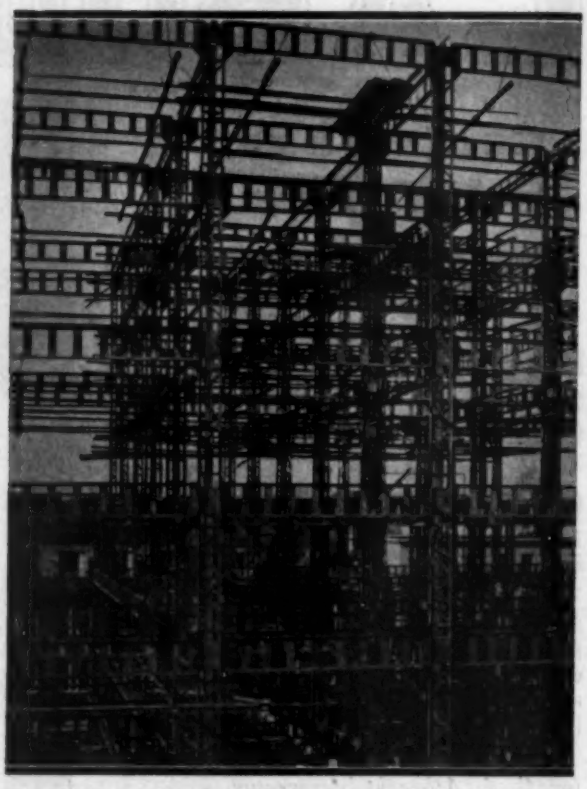
Arbitration in the Construction Industry

ARBITRATION is the oldest method of settling disputes known to man and history shows that, even after regular courts were established, recourse to arbitration continued to be frequent among many of the most civilized nations at all periods from remote times to the present. However, an ancient dictum of the English law courts dating back to the reign of George III and stating that "A man cannot by his own act make such authority, power or warrant not countermandable, which is by law and its own nature countermandable" has done much to hinder the course of arbitration as a means of peaceful settlement to disputes. This dictum was brought over to the United States with the system of English common law which was adopted here and has dominated American legislative and judicial decisions in the important matter of arbitration until the passage of the New York Arbitration Statute in 1920. Since then more and more action is being taken throughout the 48 states to legalize and promote arbitration as the easy, expeditious and economical way out of possible misunderstanding or disputes.

In the field of contracting especially, there seems to be a need for the use of arbitration in the disputes and questions which invariably arise and a number of organizations, such as the New York Building Congress, are doing work in this field. In comparing arbitration with litigation, it is well to remember that the objects of the two processes are different. Resort to litigation implies that a party is desirous to obtain the maximum of his rights according to the technicality of the law and to be vindicated as a matter of public record in his contention. The object of arbitration is quite different. It is a trade practice, having for its object justice to all concerned as well as the maintenance of commercial peace. It is a preventative of ill-will and serves as a preservative of good-will and not as a substitute for litigation, that arbitration is fostered by American business.

Among the advantages ascribed to arbitration may be mentioned the following: Arbitration conserves friendly relations. It is trite to say that lawsuit often becomes mere battles where each party is trying to do the other the greatest amount of injury. And this sort of procedure is necessarily followed by ill feeling. But with arbitration, there is settlement made in a sane and just procedure, according to an agreement of both parties and there is little opportunity for hard feelings to arise.

Another advantage is that arbitration is private. The publicity and notoriety which unavoidably accompanies a court trial never proves to be an asset and often proves to be a detriment to the parties involved. In arbitration there is a minimum of embarrassment in this way. Business has always been technical and more or less a law unto itself. When disputes arise and are taken to court, the necessity exists not merely of proving the case but of educating the jury to the point of understanding the relevancy of the facts. In many cases the majority of the jury are actually unqualified in mentality and experience to deal justly with the situation. Arbitrators, if wisely selected, bring to the case the utmost in knowledge of technicalities and terminology of the industry as well as a background of education and experience along the lines of the case. This makes for fairness and dignity in dealing with the matter.



The Self-Supporting Steel Frame of the Yaesu Building Which Was Built as a Completely Reinforced Concrete Structure Plus the Steel Frame

Arbitration also saves time, first by securing a final decision in less time than is usually possible in the courts, and secondly, in reducing the time actually devoted to the trial. And not only time is saved but arbitration gives the poor man a chance for a just and fair settlement where the financial strength of the opponent does not count.

More and more people are turning to arbitration as a means of settling disputes and incipient law suits, and it is to be hoped that soon legalized arbitration will be provided for all the states, thus lifting from commerce and industry a tax for litigation which next to war is the heaviest burden business has to bear.

These remarks are a summary of a speech delivered by L. K. Comstock, Chairman of the Board of L. K. Comstock & Co., New York, at the annual meeting of the Indianapolis Building Congress.

Ransome 21-S Standard Building Mixer HELPED MAKE this RECORD

THE Macdonald Spencer Engineering Company finished these tanks for the Edison Portland Cement Company March 27th, 1929, within 48 days after the contract was awarded. Concrete was mixed and poured 24 hours a day right from the time the actual structure was started.

A Ransome 21-S Standard Building Mixer produced the 2,926 yards of concrete required. A Ransome hoist bucket, Ransome chutes and Ransome carts did their share.

Dependability that insures "production" and production that means profits are certain with Ransome equipment—reasons why Macdonald Spencer standardized on Ransome.

Ransome Concrete Machinery Company

1850—Service for 79 Years—1929

Dunellen New Jersey

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Contractor's Responsibility to Workmen for Defects in Material

In the course of erecting a steel and concrete building under the supervision of a general contractor, an employee of an independent contractor for the installation of electrical wiring was injured through the breaking of a knotty joist supporting temporary flooring. Suit was brought against the general contractor on the ground that the accident resulted from negligence on the part of his workmen in selecting knotty material for the joist. A jury brought in a verdict in favor of the injured man, but the Maryland Court of Appeals ordered a new trial on the ground that the trial judge had erroneously authorized an award on the mere ground that a more secure flooring might have been constructed. (M. A. Long Co. vs. State Accident Fund, 144 Atl. 775, decided February 15, 1929.) The principal reasoning of the Court of Appeals is as follows:

"By the very nature of things, workmen around a building of this kind are required to use and do use temporary structures which, if they were intended for permanent use, would be unsafe, and which in the latter event would subject the employer to a suit for injury resulting from such construction. . . .

"In our opinion, notwithstanding the failure of the employee appellant [the general contractor] to detect the weakness of the particular joist which broke, due to the presence of knots, when that joist was only to be used in a temporary structure, and when it is shown that it broke before the temporary structure was completed, and, further, that in the purchase of the lumber, of which the broken joist was a part, the type and grade used was that usually and ordinarily by contractors and builders generally, the grade being such as usually contained knots, there was no actionable negligence on the part of the appellant, and the jury should not have been permitted to bring in a verdict in favor of the plaintiff, because they may have believed there was a better and safer way to have constructed the temporary forming."

Paving Maintenance Bond Held to Make Board Judge of Necessity for Repairs

A bond given by an Arkansas paving contractor for maintenance for five years was held by the Supreme Court of that state to vest an important district board with power to determine the necessity for repairs within that period (Connelly vs. Beauchamp, 13 S. W. 2d, 28, decided January 28, 1929). The substance of the court's reasoning is thus indicated in the opinion:

"The bond itself provides that the determination of the necessity for repairs shall rest entirely with the board, or, after it has turned the street over to the city of Little Rock, with the city engineer of said city, whose decision upon the matter shall be final and obligatory upon the contractor. That necessarily means a determination by the board of the necessity of repairs which, under the contract and bond, appellants were required to make. . . .

"Appellant does not contend that there was any fraud or bad faith in the determination or decision of the board, and, having agreed that the decision should rest with the board, that is final unless there was some fraud or bad faith."

General Contractor as Constructive Employer Under Workmen's Compensation Acts

In Maryland and some of the other states there are provisions of the workmen's compensation acts, making a general contractor constructively the employer of workmen of subcontractors. But it is not always clear whether or not the provision should be applied to a given case. For example, in the case of M. A. Long Co. vs. State Accident Fund, 144 Atl. 775, decided by the Maryland Court of Appeals February 14, 1929, an employee of an electrical contractor was injured and sued to hold the general contractor liable on the ground that the injury occurred through its negligence in using defective lumber in temporary flooring.

The general contractor sought to evade this common-law action for damages, on the ground that the accident was covered by the Maryland workmen's compensation law—that the general contractor was constructively the employer of the injured man, although the latter was directly employed by the electrical contractor, whose work was done under direct contract with the owner. But the court ruled against this contention on the ground that the electrical contractor was an independent contractor although engaged on a job over which the general contractor had general supervision. The case did not come within the following stated test laid down by the court:

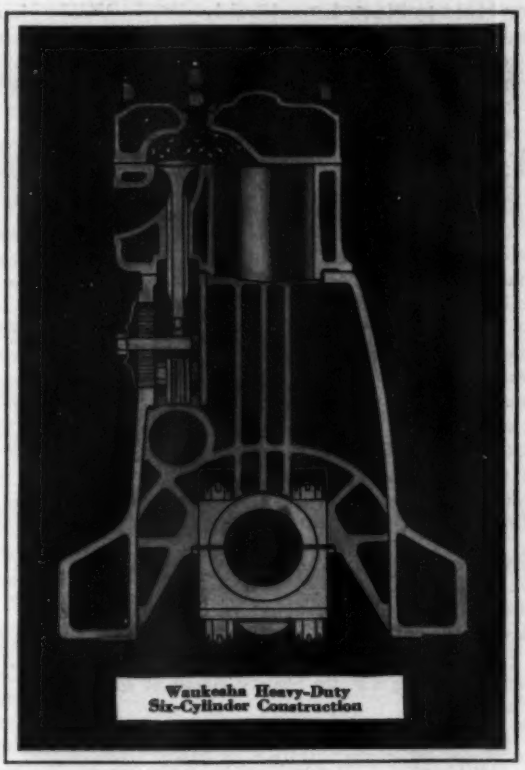
"To create the principal contractor a statutory employer, he must have contracted in the first instance to do the work himself, and subsequently sublet the whole or a portion of it to some one else. Under such circumstances the employees of the person or corporation to whom the contract or a portion thereof is sublet become the statutory employees of the principal contractor."

Liability of Retiring Partners

When a partnership of contractors is broken up by a retirement of one or more of them, and the retiring members are not willing to run the risk of being held liable on debts subsequently incurred by those continuing business under the old firm name, they will do well to see to it that all parties who have previously dealt with the old firm as creditors are *actually* notified of the dissolution. It will not do to assume that because notice of the dissolution has been published, that lets the retiring members out. Nor is that result effected through the mere *mailing* of notices to those who have previously extended credit to the firm. Mailing of a properly addressed and stamped letter raises a presumption of receipt by the addressee, but, if it be proved that the notice was not received, the letter is ineffective.

These points were recognized by the Kentucky Court of Appeals in the case of R. C. Poage Milling Co. vs. Joseph Howard & Co., 13 S. W. 2d, 266, decided January 15, 1929.

In the cited case, credit had been extended to defendant firm on the faith of membership stated in a letter written to plaintiff. But one of the members of the old firm denied liability on the ground of retirement from the partnership before the bill sued on was incurred. Because it was proved that no notice of the dissolution had been received by the plaintiff, the membership of the old firm was held liable on the debt.



In an Emergency

. . . when reserve power is needed, Waukesha Engines never fail. There is no compromise in their design or construction . . . no limiting of power purposely, to reduce the stress in the frame.

Waukesha's "girder" type crankcase is designed for extra rigidity, both in bending and in torsion. The crankshaft is oversize—3½ inches in diameter. The steel backed bearing caps are held by four heat-treated alloy steel stud bolts. Reciprocating parts are closely paired and accurately balanced. Not only is objectional vibration thus eliminated but the combining of "girder" crankcase, rigid bearing and crankshaft construction is an exclusive Waukesha feature that makes double flywheels and dampeners unnecessary. Write for Bulletin 628. *Waukesha Motor Company, Waukesha, Wis., New York Office: 8 West 40th St., San Francisco: 7 Front St.*

954

WAUKESHA ENGINES

Contractor Held to Have Inexclusably Abandoned Contract

An Iowa contractor undertook to alter and remodel a dwelling house under a contract guaranteeing that the aggregate cost would not exceed $3,050. He was paid $1,680.50 as the work progressed, but the architect refused to issue certificates for $1,576.61, since that would overrun the guaranty. Thereupon the contractor refused to proceed with the work and the owner employed other builders to complete the job.

The first contractor sued to enforce a mechanic's lien, but lost out. In an opinion handed down January 8, 1929, in the case of Johnson vs. Vogel, 222 N. W. 864, the Iowa Supreme Court upheld judgment in favor of the owner on his counterclaim for $2,300.93, plus interest and costs, because of expense in completing the work. Said the court:

"The owner was justified in not paying the increased amount demanded by the appellant. He was also justified in not paying any additional amounts to the appellant without the certificate of the architect, who was in control and had supervision of the work, and when the amounts demanded by the appellant would exceed the limit of the contract price for the entire job.

Place Where Transient Construction Equipment Should Be Taxed

An interesting and important subject not previously mentioned in this department is raised by the decision handed down December 31, 1928, by the Oklahoma Supreme Court in the case of Standard Paving Co. vs. County Board of Equalization, 273 Pac. 201.

The paving company's principal place of business is Tulsa, near the center of Oklahoma. It had equipment, consisting of a steam shovel, graders, etc., in Beckham County, in the extreme western part of the state. The company made a return of this property to the Tulsa County tax authorities, but the Beckham County exactors of "tribute to Caesar" insisted that the equipment in that county was taxable there. Hence, the above cited lawsuit.

The district judge in Beckham County decided in favor of that county and the paving company appealed to the Supreme Court, which reversed the decision and ordered a new hearing.

As we read the opinion of the higher court it holds that the record failed to show definitely whether the property was taxable in Beckham County, because it was not shown whether or not the equipment was permanently or only temporarily or transiently stationed there. The intimation seems to be that if the equipment was in the county for the sole purpose of performing a job there, it was not taxable in that county, but if the company maintained a sort of branch storage plant there, sending the equipment out as needed nearby and returning it there, instead of to Tulsa, on completion of a particular job, it would be taxable in Beckham County.

The decision was influenced by Oklahoma statutes, but the following parts of the opinion may be read with general interest throughout the country, because it probably will be found that in many states the tax laws closely follow the Oklahoma statutes on the principal question involved.

The particular clause of the statute involved in this case is one declaring that "when a person is *doing business* in more than one county, the property and credits existing in any one of the counties are to be listed and taxed in that county."

The Supreme Court decided that the Beckham county authorities were in error in assuming that the equipment was taxable there merely because found in that county, and yet that the paving company was incorrect in its position that under no circumstances could the property be taxed other than in Tulsa County.

The high spots of the Supreme Court's opinion read as follows:

"From these statutes it is clear that, in all cases where the taxation of personal property is involved, it was the express intention of the Legislature to tax such property in the particular taxing jurisdiction where the property is situated with some degree of permanency and used, or having been used, in doing some substantial part of the business of its owner. In this respect there is no difference whatever between the property belonging to corporations and the property of individuals or unincorporated concerns. . . .

"Having definitely reached the conclusion that property of an individual or a corporation is taxable as above set forth, the next question which arises and is here presented: Is, or was, the property used in such a manner, in such other county, as to make it, in point of fact, a part of the property of the particular local taxing jurisdiction? Is the property there temporarily, or does it possess a degree of permanency, and incorporated into the bulk of other like property in the county, which give it the same characteristics as properly belonging to local residents engaged in doing business of like nature in the particular community?

"Our statute, as a precedent to taxation of personal property in more than one county or in the county other than the residence of the individual or corporation, provides that the owner must be 'doing business' in such other county than the owner's domicile. The term 'doing business' imports some considerable degree of permanency as against mere temporary or casual presence. . . .

"The property of an individual or corporation cannot escape taxation, in the particular local jurisdiction where he or it is doing business, by an intention to remove it at some future time upon the happening of a certain contingency, for it might be said that all property is subject to such. A criterion is whether the property is there for an indefinite time or some considerable time, and is used or exists there to be used in much the same manner as other property is used in that community.

"On the particular point under discussion there is a certain analogy between taxation of personal property, as between different states, and the taxation of such property, as between different counties in the same state. . . .

"Section 9625, pertaining to 'doing business in another county,' implies a continuity of conduct in that respect, such as might be evidenced by the investment of capital and with the maintenance of an office or place for the transaction of business, and those incidental circumstances which disclose and attest an intent on the part of the corporation or individual to avail itself of the privilege of carrying on a business there, such as will result in a portion of its property being incorporated in the bulk of the property of the county, and used for some substantial period of time."

Employment Contract Duration

That a contract of employment does not become one for a minimum period of a year merely because it states a salary payable on a yearly basis is a proposition that has often been laid down by the courts. This rule was reaffirmed by the Washington Supreme Court in the case of Davidson vs. Mackail-Paine Veneer Co., 271 Pac. 878. In that case defendant offered plantiff a position at "six thousand annually," and he accepted, confirming the engagement "at a salary of $6,000 a year." The court said, in an opinion handed down November 27, 1928:

"The law of the case seems to be well settled that a contract such as this constitutes an employment for an indefinite period, and that such a contract may be abandoned by either party at will without incurring any liability therefor."

Heat Stroke as Compensable Accident

The Pennsylvania Workmen's Compensation Act entitles an employee to an award for injury sustained through heat or sunstroke, suffered in the course of his employment, holds the Supreme Court of that commonwealth in the recent case of Clemens vs. Cornish, 144 Atlantic Reporter, 821.

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Firm Member's Right to Salary

When two or more contractors join their fortunes—or misfortunes—by forming a partnership one of the numerous things that ought to be distinctly understood at the very outset is how much salary, if any, each member is to draw. And, if the conditions of the business so change after the partnership is formed as to lead any member to believe that he ought to be paid a salary, or that an existing salary should be increased, he should put the matter squarely up to his associate or associates.

This thought naturally arises on reading of the decision of the Texas Court of Civil Appeals in the case of Montgomery vs. Burch, 11 S. W. (2d) 545, decided November 21, 1928.

For three years nothing was said about either of two partners drawing salary, and none was drawn, because the business was run by employees. But this arrangement proved to be another of those common cases where a business run by employees did not prosper, and it was agreed that Burch should give all or his principal attention to the establishment. He did it for four years, without anything being said as to salary and without his crediting himself or drawing anything on that account, until it was agreed that Montgomery should sell his interest to Burch. In the meantime, Montgomery had given no attention to the business, except occasionally to look over the books. He lived in another town and gave his attention to individual interests there.

In winding up the firm affairs, litigation arose as to Burch's right to credit himself on the firm's books with 47 months' salary at $200 per month. The court decided that, despite his long delay in claiming this salary, it was open to the jury to find, as they did, that Burch was entitled to the special compensation claimed.

Dealing with the general rules of law governing the controversy, the court recognized that, ordinarily a partner is not entitled to a salary for services rendered in connection with the firm business, although he may have rendered more services or more valuable services than his associate. But the court holds that this case fell within the following stated exception to the general rule:

"A case where an active and managing partner devotes his whole time and attention to a partnership business at the instance of the other partner, who was attending to his individual business and gave no time or attention to the business of the firm, presents unusual conditions which take the case out of the general rule as to compensation, and warrants the implication of an agreement to pay compensation."

But the decision of the court on one vital phase of the case is of doubtful soundness—where it holds that on the eve of dissolution, Burch could credit himself on the firm books with 17 months back salary, without having ever previously indicated any intention to make any salary claim, and, apparently, without any reasonable explanation, if any explanation at all, as to why he rendered services so long without saying anything about salary if he expected to draw any. We do not believe that this part of the decision of the court can be too confidently relied upon as indicating what other courts might hold in similar cases.

Proving Correctness of Account

It would seem to go without saying that every contractor should keep a complete set of books showing all the items of his business transactions. But that meager records may serve in a pinch is indicated by the following extract from the opinion filed by the Iowa Supreme Court December 14, 1928, in the case of Edwards vs. Cooper, 222 N. W. 376; this being a case in which appellee, a contractor, sued an owner for work and materials furnished:

Apellee introduced in evidence the items of the account kept in the form of slips. No books of account were kept, and these slips were shown to have been the original entries of the account and were therefore clearly admissable."

State Highway Contractor Held Not Liable for Subsidence of Abutting Land

Making of a 12-foot cut in building a state road in Kentucky resulted in cracks and fissures appearing in one of the banks and finally resulting in subsidence of the abutting ground to the damage of the owner. In an opinion handed down December 21, 1928, in the case of Robinson vs. Hunt-Forbes Construction Co., 12 S. W. (2d) 303, the Kentucky Court of Appeals held that the contractor was not liable for this damage, because he had done his work according to the State's plan and was not negligent. The gist of the decision appears in the following extracts:

"The state is the sovereign and is not suable without its consent. It has not given its consent. Therefore the state could not be sued by appellee [the property owner] for the damages, if any, caused him by the construction of this road. It is contended, therefore, that appellant [the contractor] could not be held responsible for any damages occasioned in the performance of the contract made with the state if that performance was without negligence and within the terms of the contract. That seems to be the rule in this state. . . .

"The counsel for appellee contend that there was enough evidence to carry the case to the jury on the question of negligence. We do not find any evidence in the record tending to show that appellant negligently constructed the road. It is suggested that a retaining wall should have been built after the removal of the natural lateral support to the land of appellee; but the contract that appellant had with the state is not shown to have required appellant to erect a retaining wall. The state highway department presumably knew the grade that was to be established and what would be necessary to establish it, and if it failed to require appellant to provide a retaining wall to protect the road against slip-ins, the negligence was not that of the contractor. It is also suggested that the contractor did not notify appellee that it was doing work which necessarily removed the lateral support to his land, but he lived 50 feet from the cut, and it can hardly be imagined that he did not know what was going on. We find no proof of negligence. If the proof should establish negligence on the part of the appellant the case should be submitted to the jury on that issue, but under the proof in the record, it should not have been submitted to the jury."

Contractor Lending Employees and Equipment to City Held Not Liable for Injuries to Abutting Property

In the case of Board of Common Councilmen of Frankfort vs. Hall, 13 S. W. 2d, 755, decided by the Kentucky Court of Appeals, January 29, 1929, plaintiff, as owner of a lot in Frankfort, sued for injury to his lot and fence in the course of a street improvement. He joined the city and a paving company as co-defendants, but the court decided that the paving company was not liable for reasons stated as follows:

"The Andrews Asphalt Paving Co., had no contract to do any work on Polsgrove and Dabney Streets. Its only connection with that work was to allow the city the use of its tools, steam shovel and men. No charge was made for the use of the property, but the city was required to pay the actual wages of the men and the actual cost of operation and maintenance of the equipment. The paving company required the city to use its men on account of their special training in handling and taking care of the equipment. It was established by the evidence without contradiction that the city alone did the work, using the tools, equipment, and men of the paving company, under the arrangement stated. The city was in sole and exclusive charge of the work, and in like control of the men and machinery. The men were under the orders of the city, and it could begin and stop the work at will. Under such circumstances, the owner of the tools and machinery is not liable for damages arising from the acts of the city while using the appliances lent to it."

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THIS Armco Corrugated Pipe was used as a siphon — a flood moved it ten feet out of line as shown by the photograph. The result — the strongly connected rugged pipe remained intact in spite of this unusual test. There was no interruption in drainage service. The corrugated siphon, unbroken, has delivered water continuously.

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Construction Industry News

Schofield-Burkett Construction Co., Macon, Ga., has announced the appointment of John Walker, formerly connected with the Engineering Department of the Dorr Co., as Manager of its Eastern Sales Office. Mr. Walker's address is 150-02 Sixth Avenue, Whitestone, N. Y.

Paradon Manufacturing Co., Arlington, N. J., announces the appointment of L. E. Layne, 30 North Michigan Ave., Chicago, Ill., as a direct factory representative. Mr. Layne will have charge of the sales and servicing of Paradon chlorinators in the states of Illinois, Indiana and Southern Wisconsin.

Construction Machinery Co., Waterloo, Iowa, manufacturers of Wonder tilting concrete mixers and contractors' pumps and hoists and Marsh-Capron drum type concrete mixers has announced the appointment of the following distributors for its complete line: George V. Treen, 520 Monroe Bldg., Charleston, W. Va.; Bournival & Co., 336-340 Notre-Dame E., Montreal, Canada, and Construction Equipment Co., 310 Dooly Block, Salt Lake City, Utah.

Sullivan Machinery Co., 400 North Michigan Avenue, Chicago, Ill., has announced the appointment of the following distributors for the Sullivan line: McCarthy, Jones & Allen, Nashville, Tenn.; Tri-State Equipment Co., Memphis, Tenn.; Garfield Co., Hearst Bldg., San Francisco, Calif.; Frank Wriggle, 1009 Rector Bldg., Little Rock, Ark.; Smith-Meadow Supply Co., Birmingham, Ala., and McGowin-Lyons Hardware Supply Co., Mobile, Ala.

The Huber Manufacturing Co., Marion, Ohio, has announced that A. W. Newby, formerly Vice-President, has been elected President and General Manager, succeeding S. E. Barlow, resigned. Mr. Barlow has been elected Chairman of the Board.

The Chain Belt Co., Milwaukee, Wis., announces that R. T. Steindorf, assistant to W. B. Marshall, Conveyor Sales Manager, has been transferred to the Cleveland office at East 200th Street and St. Clair Avenue. Mr. Steindorf,

MEMBERS OF THE 1929 EXECUTIVE COMMITTEE OF THE ASSOCIATED EQUIPMENT DISTRIBUTORS

Top Row (left to right): A. A. Fuchs, President, Fuchs Equipment Co., Omaha, Nebr.; M. Kaplan, Sales Manager, Superior Supply Co., Chicago; N. Floyd, Jr., Treasurer, Hubbard-Floyd Co., Inc., New York; A. C. Blaisdell, Secretary, The Queen City Supply Co., Cincinnati, Ohio. Center Row: Carl G. Borchert, President, Borchert-Ingersoll Co., St. Paul, Minn.; Edward R. Bacon, President, Edw. R. Bacon Co., San Francisco; M. R. Hunter, President, Hunter Machinery Co., Milwaukee, Wis., and Detroit and Grand Rapids, Mich.; Dan R. Brown, Secretary, Brown-Bevis Co., Los Angeles, Calif.; E. K. Hurst, President, Western Material Co., Sioux Falls, S. D. Bottom Row: William T. Walsh, Secretary, Day & Maddock Co., Cleveland, Ohio; George F. Smith, President, Geo. F. Smith Co., St. Louis; Oscar Bjorge, General Manager, Clyde Equipment Co., Portland, Ore. The next issue of THE EQUIPMENT DISTRIBUTOR *(which is published by* CONTRACTORS AND ENGINEERS MONTHLY*) will contain an article by M. Kaplan on the growth of the A. E. D. and give some interesting sidelights on the men who make up its Executive Committee*

Dependable, Economical Curing for CONCRETE PAVEMENTS

THE most dependable and economical method for the proper curing of concrete pavements is open to you through the use of Solvay Calcium Chloride.

Used integrally Solvay Calcium Chloride provides the most satisfactory known means of curing concrete. Applied with a Solvay Hand Spreader it makes surface curing a one-man job.

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40 Rector Street **New York**

who has been with the company for five years and has been connected with several of the company's branches, will be located at the Cleveland office. Chain Belt also operates the Stearns Conveyor Co., at Cleveland, where belt conveyors are made.

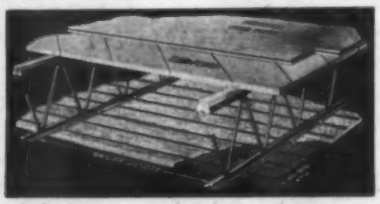
R. H. Beaumont Co., 319 Arch Street, Philadelphia, Pa., has announced the appointment of L. H. Moule as Sales Engineer. Mr. Moule, who has been with the company for twelve years, will be connected with the Philadelphia office.

Stover Manufacturing & Engine Co., Freeport, Ill., has announced that management of the company is now in the hands of John W. Heeney, as Chairman of the Board; H. W. Bennethum, President of the company and Lee Madden as Vice-President in complete charge of sales. There will be no general change in the management's policy.

John D. Owens Dies

JOHN D. OWENS, one of the founders of the Osgood Co., and father of C. A. Owens, President of the company, died June 24 at the age of 72 following an illness of two weeks. Mr. Owens at the time of his death was serving as Chairman of the Board of the Osgood Co., and acting in an advisory capacity to all the Owens' interests.

Mr. Owens made his start at the age of twelve and during his long career he achieved success in many diversified fields of endeavor. He retired as an active executive in 1920 but from that time up to his death, he took an active interest in his various business connections and visited them almost daily.



The New Truscon Steel Nailer Joist

A New Steel Nailer Joist

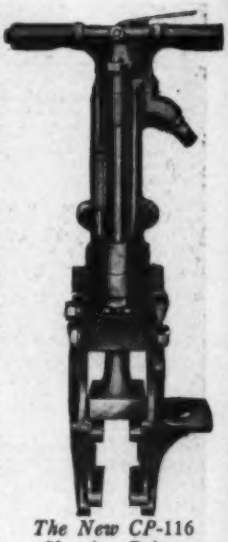
A NEW steel nailer joist for use in all structures where wood floors are to be used has recently been developed by the Truscon Steel Co., Youngstown, Ohio. The usual practice where wood floors are to be installed over steel joists is to lay a sub-floor of concrete slabs over the joists and place the wood flooring on the concrete. The new steel nailer joists permit the placing of the rough flooring directly on the joists, and the finished floor is then laid on the rough flooring.

These new Truscon steel nailer joists consist of an open web truss of steel, with a wood screed or strip embedded in the top member and projecting 1½ inches above the steel. The rough flooring is nailed directly to this wood screed just as it would be attached to a wood joist.

A special nailer joist adaptation to roof construction also has been developed for use in buildings where wooden plank roofdeck is erected. This permits the usual rigid steel building structure, the roof planks being nailed directly to wood screeds attached to the steel joists. These special joists are available in any lengths, weights and strengths to conform to roof dimensions and design.

A New Portable Pneumatic Sheeting Driver

THE recently developed CP-116 sheeting driver, which is manufactured by the Chicago Pneumatic Tool Co., 6 East 44th Street, New York, is designed primarily for use with wooden sheeting, though light steel sheet piling can also be successfully driven. This new piece of equipment is essentially the CP-116 demolition tool with a special front end, and can be used in trench work and excavations, and in formations that sheeting will penetrate without breaking, such as clay, sand, gravel and similar material.



The New CP-116 Sheeting Driver

This sheeting driver is low in air consumption and has no tendency to freeze in cold weather. It is of the valveless type, has only one moving part, the piston is symmetrical and light enough for ready portability and use as a one-man tool. It is furnished with one guide plate with step and one without, but may be furnished with two of either, if desired. Adjusting plates provide for various sizes of sheeting, including 2¼-inch opening for 2-inch sheeting, 1¾-inch opening for 1½-inch sheeting, and 2¾-inch opening for 2½-inch sheeting. The omission of plates gives a 3¼-inch opening for 3-inch sheeting. The handle can be assembled parallel to the sheeting, or at right angles, as shown in the illustration.

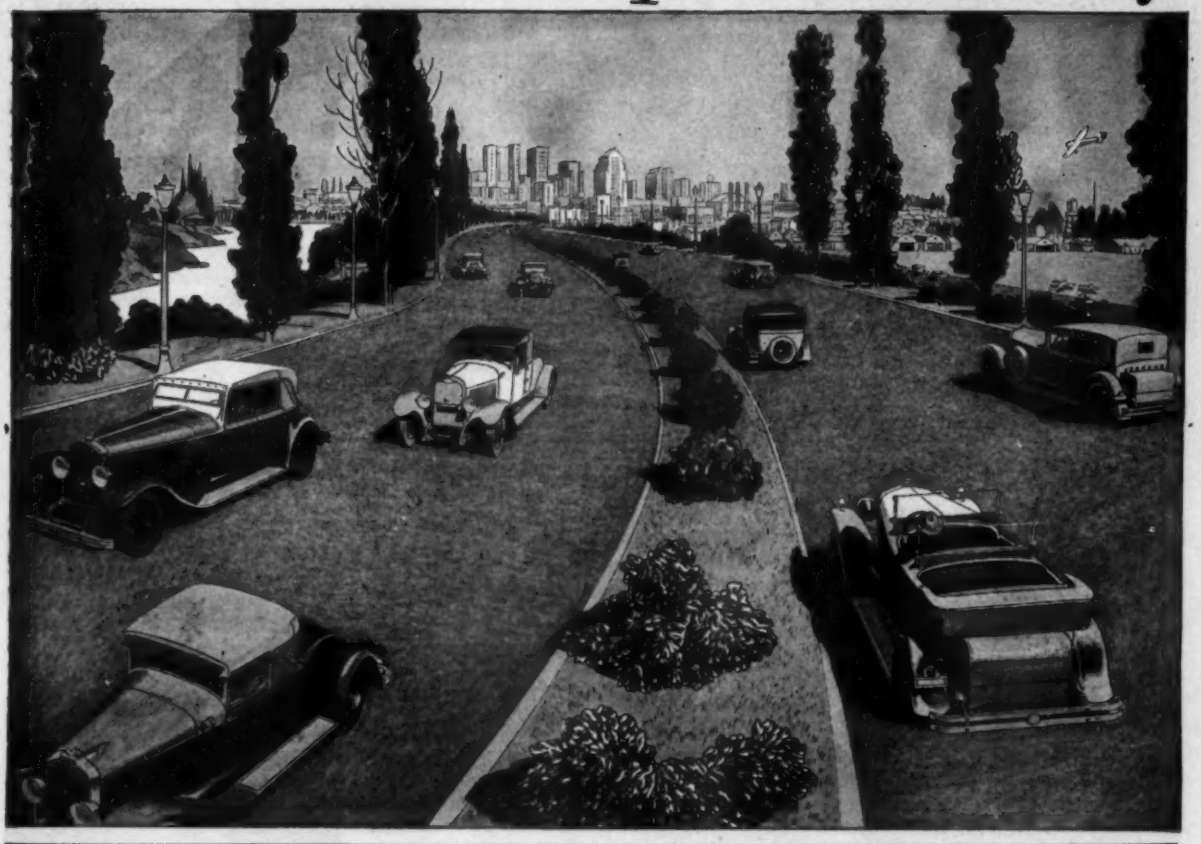
A Rivet Piercing Tip

THE Milburn rivet piercing tip, recently developed by the Alexander Milburn Co., 1416-1428 W. Baltimore Street, Baltimore, Md., introduces a new method of consuming the head of the rivet and the body of the rivet. This is done by centering the tip over the rivet head and preheating the head to a melting point, which leaves the remains of the rivet head in the shape of a ring. Simultaneously with the cutting oxygen jet the body of the rivet is pierced, and due to expansion or contraction of the plate the rivet drops out or is backed with a slight effort.

This method with the Milburn rivet piercing tip leaves the sheet or plate uninjured and passes all tests or inspection. The ease in removing the rivets speeds up work and the amount of injured sheets is reduced to a minimum.

The New Method of Removing Rivets by Use of the Milburn Rivet Piercing Tip

The formula for *Speed* with safety



POWER plus room in which to use it—that's the formula for speed with safety.

Dozens of unused horsepower are straining at the leash in nearly all of our 25,000,000 cars, but roads wide enough and safe enough to give that power a chance are still somewhere in the future.

The solution of the problem is not so complicated as it appears at first glance. States, counties and towns are working it out with Tarvia low-cost construction and maintenance and the active assistance of Tarvia engineers, Tarvia equipment and The Barrett Company's 26-years of road-building experience.

Tarvia makes it possible for your community to have the smooth, *skid-safe,* storm-proof roads it needs—quickly, without burdensome taxes.

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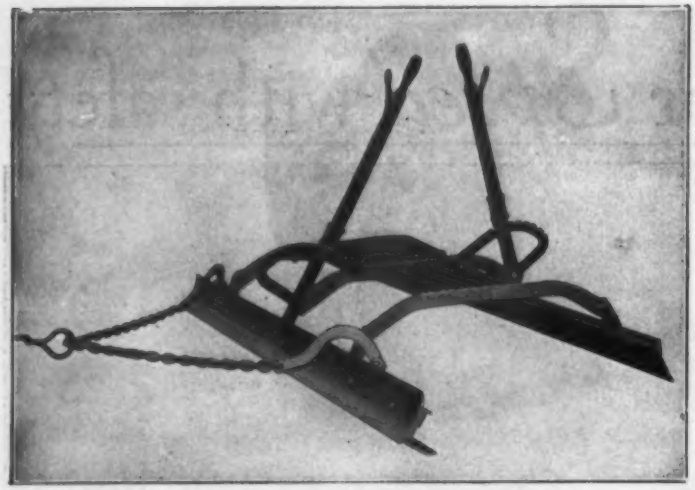


The General Planetainer

blade and swivelled to adjust the machine for working at any angle. The blade is made of high grade, special analysis grader blade steel 5/16-inch thick and curved to cut clean, while the shoe is made of ¼-inch steel plate bent to shape. The rear blade is made of ¼-inch flat steel. The blades, which are 7 feet long, are adjustable to eight positions by levers conveniently located for the operator. The rear blade offsets the forward by a foot, giving the machine an 8-foot cutting width.

For wide roads three Planetainers may be joined together, the two forward units being held apart by an adjustable angle steel strut bar, and the third unit fastened by short chains directly behind the gap between the two forward units. When joined in this manner the Planetainers will work an 18-foot strip.

For narrower roads the single or 2-way Planetainer may be used, the single unit being drawn by a team, while the 2- and 3-way Planetainers require a tractor.

A New Highway Maintainer

A NEW type of two-lever drag maintainer, known as the General Planetainer, which combines the leveling principle of the drag with the cutting action of the road patrol or maintainer, has been developed by the General Wheelbarrow Co., 3140 East 65th Street, Cleveland, Ohio. In appearance the Planetainer resembles a two-lever drag except in the front blade, which is a curved grader blade similar to that on a regular maintainer, to the back of which is attached a curved steel planing shoe that irons out the road. Figure 1 of the second illustration shows how the blade is set for planing or cutting at the grade line when the road is not filled with deep ruts. In this position the blade is carried on the shoe, holding it firm and eliminating chattering, resulting in an even cut and smooth surface.

When the road is rutty and there is much material to be moved, the blade is set as in Figure 2. With the blade in this position the dirt cut from the high spots is spread by the shoe to fill the ruts, the shoe also serving to break up clods.

For the last trip over the road, or where smoothing only is necessary, the blade is adjusted to positions 3 or 4. In either of these positions, the clods are broken and the material spread and ironed out with the shoe.

If the road is hard or there is much material to be moved, the Planetainer may be weighted down or the operator may ride on the wide platform, the channel steel cross bars providing a sure footing for him.

The Planetainer is rigidly and strongly constructed of heavy angle steel, and the frame is high arched to clear dirt being turned up by the blade. The hitches are curved high over the

Showing How the Blade and Planing Shoe Are Set to Plane, Cut or Iron the Road

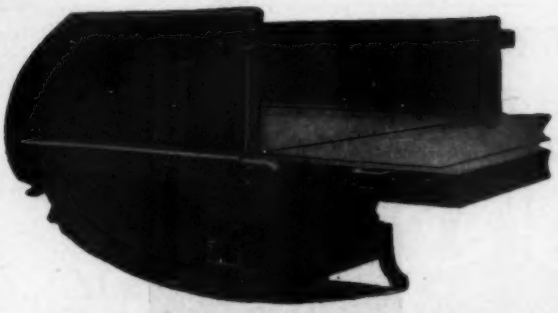
A New Type of Blow Torch

A NEW blow torch which does not need pumping, priming or preheating, known as the Sprayit blow torch, has been announced by the Electric Sprayit Co,. Inc., South Bend, Ind. This torch burns common kerosene, instead of high test gasoline and is said to produce 30 per cent more heat with a lower priced fuel than others do with gasoline. Safety is one of the leading advantages claimed for this new torch, because since there is no pumping or priming needed, there is no subsequent flowing or dripping of fuel. Also, because of the pressure break-up of the fuel, there is no carbon deposit to decrease efficiency.

The New Sprayit Blow Torch

To operate the torch the valve is turned and the torch lighted with a match. Almost instantly a hot blue kerosene flame is ready for the work. In a recent test to compare the performance of a standard model of blow torch with the Electric Sprayit blow torch 6 minutes passed before the ordinary type had a hot blue working flame of sufficient intensity to be used to melt metal. The Sprayit torch had a flame of great heat almost instantaneously. It was a matter of three or four seconds to turn the valve and strike the match before the Sprayit was ready to melt metal.

The Sprayit blow torch is well adapted for use with the agitator type Electric Sprayit. It is interchangeable with the Sprayit agitator type gun and can be connected in its place on the Sprayit compressor unit. In many lines of contracting where a spray outfit and blow torch are used on the same job or both used by the same workman on various jobs, the Sprayit combination set which consists of a complete Electric Sprayit with compressor unit and a Sprayit blow torch forms a handy kit, which gives a constant and reliable performance in all weather conditions.



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Ruggedly built dump bodies are essential for severe service.

Wood All-Steel Dump Bodies *are* ruggedly built by special machinery and skilled workmen.

They are reinforced at all points where greatest stress comes. Vital parts are of drop-forged steel.

A Wood Hoist and a Wood All-Steel Dump Body, backed by Wood service, make a complete dumping unit that increases the efficiency of any chassis.

WOOD HOISTS-BODIES

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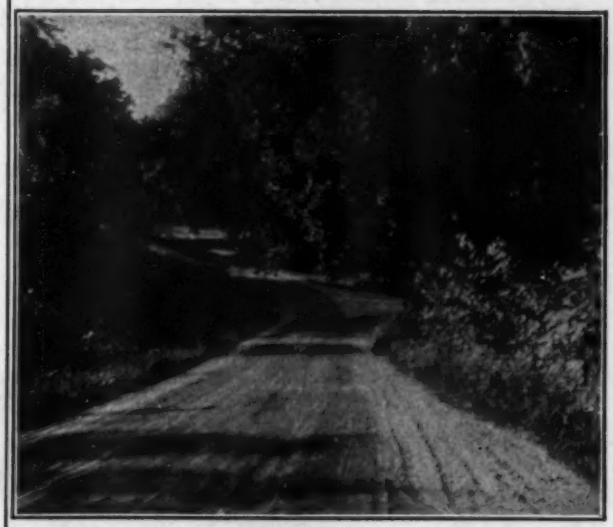
WOOD HYDRAULIC HOIST & BODY CO.
DETROIT, U. S. A.
Branches and Distributors in all Principal Cities

Inviting, Dustless Roads!



Tree-shaded side roads give us our most delightful drives—when free from dust.

Constant moisture on the surface of the road is the cleanest and most satisfactory conquerer of dust.

This result is effectively and economically achieved by the application of "3-C" Calcium Chloride. As soon as spread upon the road surface "3-C" Calcium Chloride begins absorbing moisture from the atmosphere. Within four hours it dissolves completely, forming a blanket of moist earth which does away with dust. This moist earth packs under traffic and becomes a good binder for the road surface, lessening raveling at the edges. For average roads but two applications of "3-C" Calcium Chloride per year are necessary.

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3
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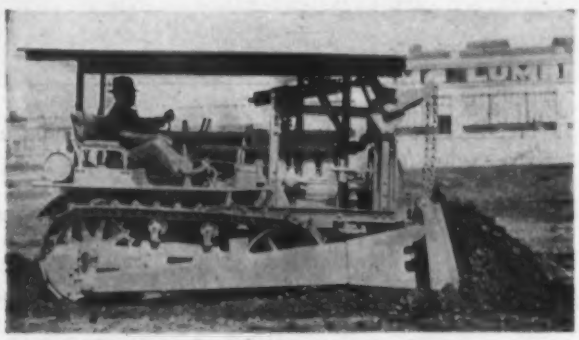
CEM-729

A New Hydraulic Bulldozer

A HYDRAULIC bulldozer for leveling dirt and dumped rock from trucks, pushing dirt and rocks over fills, backfilling trenches, building airport fields and other similar work is manufactured by the American Tractor Equipment Co., Oakland, Calif. This Ateco bulldozer is constructed of steel throughout, electrically welded, and consists of a heavily reinforced bowl, or blade, extending across in front of the tractor and connected to the tractor trucks through heavy, box-section side arms, one on each side of the tractor, which pivot on pin brackets attached on the outer sides of the tractor truck frames at a point where the rise and fall of the treads when working over rough ground will least affect the position of the blade. A structural steel framework is attached to the tractor through already existing bolt holes which supports at its front end a bell crank assembly. This is connected to the blade through chains, and a hydraulic cylinder with piston rod attached to the central arm of the bell crank raises and lowers the blade through hydraulic power secured from a pump driven by the power take-off shaft of the tractor through a special 4-way valve.



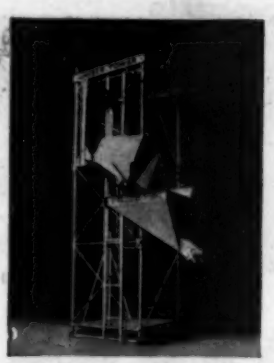
An Ateco Hydraulic Bulldozer Mounted on a Caterpillar Tractor

The hydraulic control of the Ateco bulldozer permits the driver of the tractor to raise or lower the blade instantly and accurately by means of one control lever located just in front of his seat, in the same manner that the hydraulic hoist on a dump truck is operated.

There are no parts of the Ateco hydraulic bulldozer that in any way interfere with the drawbar of the tractor and the bulldozer may be used in conjunction with the Ateco hydraulic dirtmover, both being attached to the tractor at the same time. When it is desired to remove the bulldozer to use the tractor for other purposes, this can be done in a few minutes by pulling out the two pins locking the side arms on to the pin brackets and taking two clevis pins out of the chain links connecting the blade to the crank assembly at the front of the tractor.

Material Tower With Outside Concrete Bucket

A DOUBLE diagonal tubular material tower equipped with a platform elevator and an outside concrete hoist bucket is manufactured by the Jaeger Machine Co., 701 Dublin Avenue, Columbus, Ohio. The tower is the standard Jaeger material tower which consists of four parts, the base section, the intermediate sections, the elevator cage and the top section. To this is added two swiveling foot sheaves, a foot sheave bracket, double cathead, concrete bucket with dumping device, receiving hopper and the receiving hopper support bracket and track for the bucket to travel in. The tower is square in cross section so all girts, diagonal members, corner posts and cage guides are alike. It is easily



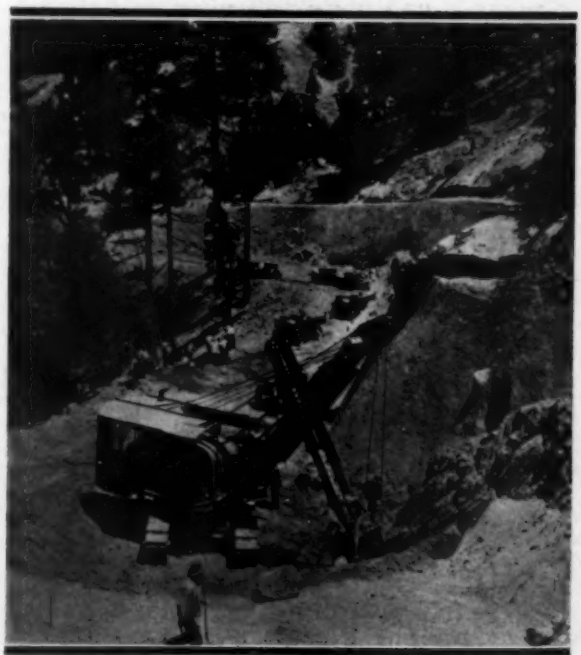
A Jaeger Concrete Tower

erected and dismantled, and can be stored in a small place.

The base section of the tower consists of 4 I-beams with the supports for first columns. Holes are provided for anchor bolts and the bottom swivel sheaves are mounted on an adjustable support bracket. All intermediate sections are 6 feet 6 inches in height and are interchangeable as to parts and position. The top section includes only two sheaves with supports. The cage is a wheelbarrow cage 69 inches by 70 inches with a maximum live load capacity of 2,500 pounds. Sheave for a double hoisting line can be installed if desired.

The concrete bucket is simple and easy to assemble. It has an 18-foot capacity, ample for mixer plants up to ¼-yard. The use of the outside bucket makes possible simultaneous operation of the bucket and cage on a single tower. The material hoisting cage operates without interfering in any way with the bucket, which can be used with a tower hopper or dumping directly into a floor hopper.

Every tower has a landing panel which is a unit consisting of a girt and two diagonal members installed to stiffen the tower at the point where diagonals and girts have been removed to permit unloading the cage. The panel also supports the runway from tower to the building floor.



A P&H Model 700 1¼-Yard Shovel Used by the Division of Highways, California Department of Public Works, on a Highway Job Between Weaverville and Redding, Calif.

Combining Two Principles

BLOCK and TACKLE and LEVER ARM

RESULTS

Multi Power

More Power

This bucket can be rigged up with 2, 3, 4, 5 or 6 parts of line to suit the kind of material being dug. It will dig as well or better than any bucket of equal weight and parts of line.

Oversize

The bucket is oversize capacity with but very little added bucket weight.

More Speed

It is faster with six parts of line than other buckets with four and five. This gives more total yardage handled at the end of the day.

Adjustable

200 to 600 pounds of counterweights in 100 pounds increments can be added easily by one man.

READY FOR IMMEDIATE SHIPMENT IN ½ AND ¾ CUBIC YARD SIZES

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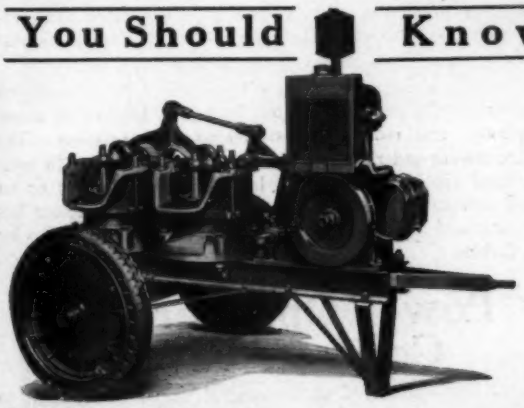
You Should Know the New LAUSON

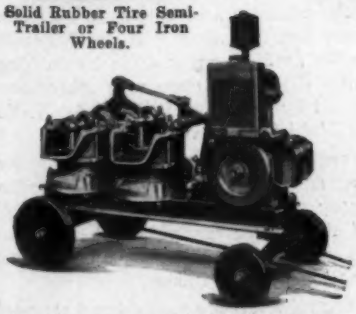


Solid Rubber Tire Semi-Trailer or Four Iron Wheels.

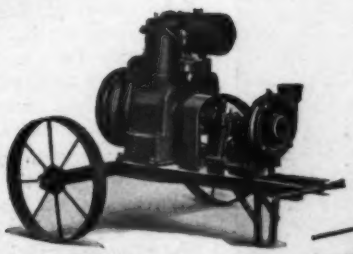
Double Diaphragm Pumpers With Vertical Motors

These units are furnished with any leading makes of pump powered by high grade 2½ to 3 H.P. Lauson Vertical radiator cooled engine. Engine has built-in gear reduction and one set of carefully guarded gears operates the special Lauson Jack. Neat, compact, light weight; 775 pounds complete. Engine speed ranges from 900 to 1800 r.p.m. with good surplus power at all speeds. Can be speeded up to maximum capacity of pumps delivering 7000 to 9000 gallons per hour.

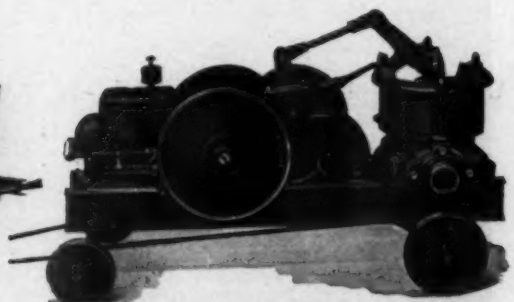
Let Us Tell You About Them



Our Line comprises Vertical Air, Radiator or Tank Cooled Motors and Horizontal Engines—1½ to 35 H.P. for all sorts of industrial installation; also Concrete Mixers.

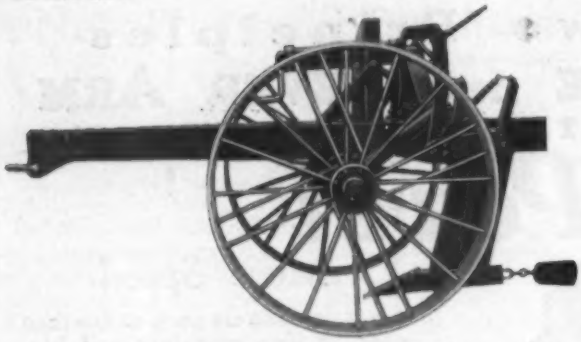


Centrifugal Units with Vertical Air-Cooled Motors—Choice of pump. Iron-wheeled Semi-trailer—or mounted on strong wooden skids.



Diaphragm Units with Horizontal Engines—Solid rubber tired semi-trailer or four iron wheels. Powered by Electric Motor if preferred.

THE JOHN LAUSON MFG. CO. 11 Jackson St., **New Holstein, Wis.**



The Killefer Mole Drainage Outfit

Equipment for Mole Drainage

MOLE drainage is a system of underdraining meadows, airports and other moderately wet land where the soil has sufficient clay content to permit the formation of a tunnel by an implement known as a mole. The Killefer Manufacturing Corp., Los Angeles, Calif., has developed a special tool for mole drainage. This tool, which is made in four sizes, consists of a pair of steel wheels, a heavy axle and a drawbar on which is mounted a subsurface point adjustable for depths from 22 to 48 inches. Behind this point is carried a torpedo shaped member or mole ball which compresses the soil and forms the burrow. With these tools burrows may be made from 3½ inches to 8 inches in diameter.

The depth of the burrow below the surface of the ground is regulated by a crank on the machine. These machines are built sturdy enough to be hauled by two Caterpillar Sixty tractors where the resistance of the ground makes this amount of power necessary. This system is of great value as an auxiliary or feeder system when laid in conjunction with perforated pipe mains. The pipe is laid in the land troughs and the mole drains are run down the natural slopes to hasten the delivery of water to the mains and to prevent downward slide in the land adjacent to the mains. It makes the pipe mains doubly effective and disposes of seepage water with the utmost rapidity. The same company manufactures a ditcher which will travel two miles per hour for the burial of the main drainage pipes when these are used.

Flow Through a Mole Drain Into a Main Ditch Before the Killefer Tool Had Completed the Entire Line

With the increased interest in and construction of airports contractors will have more and more need for this type of equipment. It is understood that the Air Service of the United States Army is to use this type of drainage at all its air fields. In road construction the mole drain provides a quick and economical method of surface water disposal. Water from highway shoulders can be assisted to escape from the edge of the right of way when proper drainage lines are built parallel to the road. This cuts down the danger of standing pools at the sides of the road, keeps the shoulders in harder, drier condition and reduces the tendency of water to soak laterally under the pavement to cause the swelling of colloidal clay which cracks the surfacing.

A New Reinforcing Plaster Base

RIBBED Steeltex for plaster, a new reinforcing plaster base, has recently been developed by the National Steel Fabric Co., Union Arcade Bldg., Box 72, Pittsburgh, Pa. The original Steeltex consisted of a welded and galvanized wire mesh with a heavy fibrous backing. This backing automatically formed a monolithic plaster slab reinforced with strong steel ribs, like steel reinforcement in concrete. It also damp-proofed the plaster and added a measure of insulation. The ribbed Steeltex, which is generally similar to the original Steeltex, has several additional features.

Horizontal V-shaped steel ribs have been added to stiffen the sheet, which lies flat, without bulges or hollows to waste the plaster, and requires no stretching or toe-nailing. The ribs are strong and rigid and yet can be readily cut with ordinary hand shears and may be bent to fit in corners or on curved surfaces. The backing of this improved Steeltex has been increased and sheets are now standard size, 50 inches by 28½ inches.

Power Operator for Concrete Paver

A NEW system of paver control which is intended to make possible the advantages of automatic operation and at the same time overcome the disadvantages which arise from a rigidly fixed operating cycle by enabling the operator to coordinate the mixing cycle with other operations, has been announced by the Foote Co., Nunda, N. Y., as a feature of its 1929 Multi-Foote paver.

The new system of control which is known as the Power Operator enables the operator to have mechanical operation when he wants it, thereby clipping every possible second off the operating cycle and at the same time enables him to take advantage of conditions caused by auxiliary equipment being late or early in coordination with the mixer.

On Foote pavers the control levers are grouped and arranged within easy reach on the high operating platform. The Power Operator is mounted about waist high left center of the platform and consists of two small levers. The shaft on which the levers are mounted is so geared that it oscillates back and forth one-quarter of a revolution. It is fitted with two cams, one for each lever, so that when either of the small operating

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Easily laid at small expense with perfect flow line.

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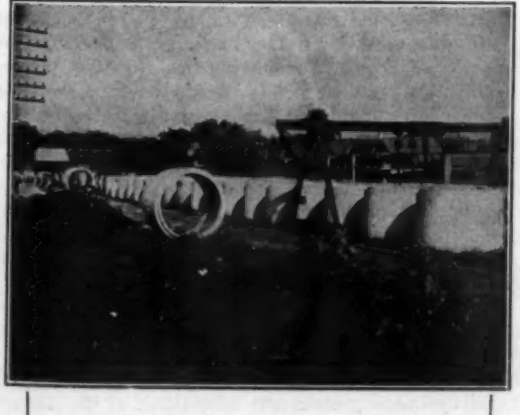

BUY BOSS MIXERS and HOISTS DIRECT FROM FACTORY

YOU GET SALESMAN'S & JOBBER'S PROFIT!

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Every manufacturer is trying to reduce his selling costs. We have found the way and are going to give the difference to our customers in order to increase our sales. We have done away with all our salesmen and jobbers and are now selling direct to users. We have deducted the salesman's and jobber's commission from each machine and the difference is our price to you. This is the most astonishing news in the construction industry and it is certainly paying us as sales are jumping by leaps and bounds. Get the new catalogue with new confidential wholesale prices on each machine. It shows the most popular types and combinations, describing each fully—with new price. The coupon will bring it.

SAME HIGH QUALITY

Regardless of this drastic price cut, the quality of BOSS Mixers and Hoists remains the same. They have always been noted for their heavy duty construction and materials. Under no considerations will we ever sacrifice this reputation. Get the catalogue. Note the specifications and compare the prices. You get the same patented Re-Mixing Action and other exclusive features that have made BOSSES preferred wherever used. Hundreds of BOSS machines have ten, twelve and fifteen years of continuous service behind them and still going strong. For quality of design, materials and construction we defy anyone to find a better built machine than a BOSS. You can now get all this for less.

BOSS 10S NON TILTER "One-Two Bagger" patented reparting action, steel construction, high speed performance with one man control.

Get Our Prices

Send Coupon for New Catalogue With Confidential Wholesale Prices

The new BOSS Catalogue gives complete information on all the BOSS Mixers, Pavers and Hoists along with the new confidential wholesale prices. Even if you do not want to order now, get this new catalogue and keep it on hand for future use. Fill in the coupon and mail today. It will save you money. Though you may have bought direct from a manufacturer before you have never been able to buy at these prices because no salesman's or jobber's commission is figured in. Prices on every machine are greatly reduced. Get the new catalogue with wholesale prices.

A COMPLETE LINE

We make over 70 various sizes, combinations and types of BOSS Mixers, Hoists and Pavers. There is a type for every conceivable use. Get the new catalogue first, then decide. Often our customers find that they can use a much lower priced machine after studying this catalogue. There is no need of going elsewhere for a certain machine when it is in the BOSS line. Write for catalogue and confidential wholesale prices; also give us information on kind of work you want the machine for. We can probably be of help to you.

NEW CATALOG—WITH WHOLESALE PRICES TELLS ALL!

THIS BOSS 21-S NOW $1,178. One bag, half drum type trailer mixer with 2 disc wheels, cushion rubber tires, batch hopper, 2 HP Stover engine, magneto, steel engine housing.

1 YEAR GUARANTEE

GUARANTEE—All BOSS equipment is guaranteed for one year against defective materials and inferior workmanship. Any parts proving defective will be replaced free of charge (electrial or engine equipment excepted, as this equipment is guaranteed by the respective engine manufacturers) upon return to us of defective parts, carrier charges prepaid for our inspection.
American Cement Mach. Co., Inc.

5 DAYS' FREE TRIAL

So confident are we that every BOSS Mixer and Hoist will give complete satisfaction, that we offer you five days' free trial. Order a BOSS. Use it in the field. If within five days you do not find it exactly as represented in every way, send for return instructions and refund of purchase price. This protects you; you can't go wrong on a BOSS. As long as we have sold on this basis, we have never had a customer demand his money. This proves BOSS quality. Every BOSS machine is backed up with an iron clad guarantee. Read it above.

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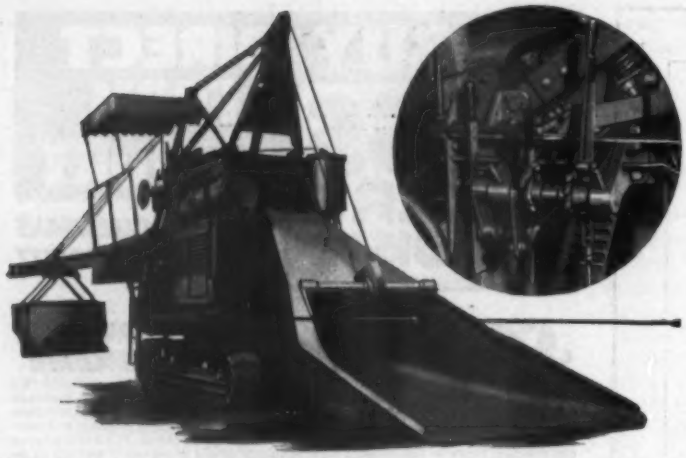


The 1929 Multi-Foote Paver With New Power Operator Shown in the Insert

levers is moved, they engage in one of the notches of the cam and the movement of the cam itself actuates the clutch.

This arrangement gives speedy operation of the control and relieves the operator of practically all effort. Another feature of the Power Operator is the fact that the operator has full control of the mixing cycle at any point. For example, the skip can be stopped when it is halfway up and raised or lowered from any position at any time the operator desires. This makes it possible for the operator to time his cycle so that it will work to the best advantage and coordinate with the other factors on the job.

New Truck Cranes Offer Additional Capacity

THE Model A truck cranes including a number of new and improved features, which have recently been announced by the Orton Crane & Shovel Co., 608 South Dearborn Street, Chicago, Ill., offer additional capacity and speedy operation. They are equipped with a 55-horsepower heavy-duty gasoline engine, giving a lifting capacity of 15,700 pounds at a 10-foot radius and 12,000 pounds at a 12-foot radius. This increased capacity makes possible the handling of heavy loads without imposing excessive strains on the working parts, a ½-yard bucket can be operated throughout the entire working radius, and extra long booms can be employed safely for setting structural steel and for similar work. At the same time the extra power and capacity permits the handling of smaller loads with rapidity, and thus adds to the amount of work which can be accomplished in a given period.

An Orton Model A Truck Crane Equipped With an Orton Model R ½-Yard Rehandling Bucket

In the design of this model, special attention was given to the distribution of weight on the turntable. A large portion of the operating mechanism, including the engine, is positioned back of the pivot post, its mass serving as part of the counterweight and thus eliminating unnecessary dead weight. The boom is of the lattice type and is electric welded. As a result of this construction, the turntable can be rotated at a speed of 6 revolutions per minute.

The housing speed for a load of 7,000 pounds and a single line is 160 feet per minute and for a load of 14,000 pounds and a two-part line is 80 feet per minute. The operating levers for the main hoist, auxiliary hoist and the swing are banked in front of the operator's position and control each of these functions by means of clutches of the radial-thrust V-type. These clutches are positive in action and are very sensitive. The throw of the levers is relatively short, so that they respond quickly to the operator's touch and require a minimum effort.

The operator's position is in a cab extension where he has a clear view of the work on both sides of the machine, enabling him to spot the load or the bucket in minimum time.

All parts of the Model A crane is designed for heavy duty and long service. The gears are made of special heat-treated alloy steel and have extra wide teeth. Spur gears are cut, and pinions are cut from solid blanks. Power shafts are also made of alloy steel and are ground to size. Interchangeable phosphor-bronze bushings are provided for all main bearings. Clutches are equipped with renewable blocks made of Orcoin, a composition which resists wear and withstands the action of heat and moisture. Electric welding is used considerably to reinforce the base, the turntable and the mountings.

The crane can be mounted on any standard 5 or 7½-ton auto-truck having a clearance of 9 feet from the center of the rear axle to the back of the driver's seat. Each machine is furnished with a structural steel base which can be bolted directly to the chassis of the truck.

One Size of Brick Reinstated as Standard

BECAUSE of the increased demand for an eliminated size of paving brick the Permanent Committee for Simplified Practice Recommendation No. 1 on Vitrified Paving Brick has recommended to the industry that the Dunn wire cut lug brick measuring 3 x 3½ x 8½ inches be reinstated as a standard type. This size brick was eliminated from the recognized standard sizes on March 20, 1925, but the shipments for this size during the last three years have gradually increased until today they represent 14.5 per cent of the total based upon the survey of the industry in 1928. By the inclusion of the size in the simplification program, the Division of Simplified Practice, U. S. Department of Commerce, has stated that the degree of adherence to this recommendation has increased from 70.1 to 84.6 per cent. There are now six standard or recognized sizes of vitrified paving brick.

Paving brick simplification was one of the initial projects developed by industry under the cooperation of the Department of Commerce. Much of the success attained by the program has been due to the support it has received from the National Paving Brick Manufacturers' Assn., according to the Division of Simplified Practice.

This tool can help you!

The Killefer Road Ripper breaks out material for scrapers, graders, bulldozers, loaders, or may be used for roughing out and bonding.

Working depth as deep as 12" (Photo at left shows our No. 10 Ripper breaking 3" of asphalt macadam on 9" of coarse rock ballast.)

Has accurate depth adjustment and great clearance below frame.

Equipped with rapid power lift.

Quick-detachable points are practical and economical.

Wheel tires are smooth for road travel.

Built in 2 models. You'll praise the work of the Killefer Road Ripper. There are 5 years of successful performance behind it.

Here's a tool with tractor strength!

Write for folder R-94 and name of nearest dealer. Agencies throughout U.S. and Canada. Killefer Manufacturing Corporation, 5525 Downey Road, Los Angeles, Calif. Branches in San Francisco, Calif. and Peoria, Illinois.

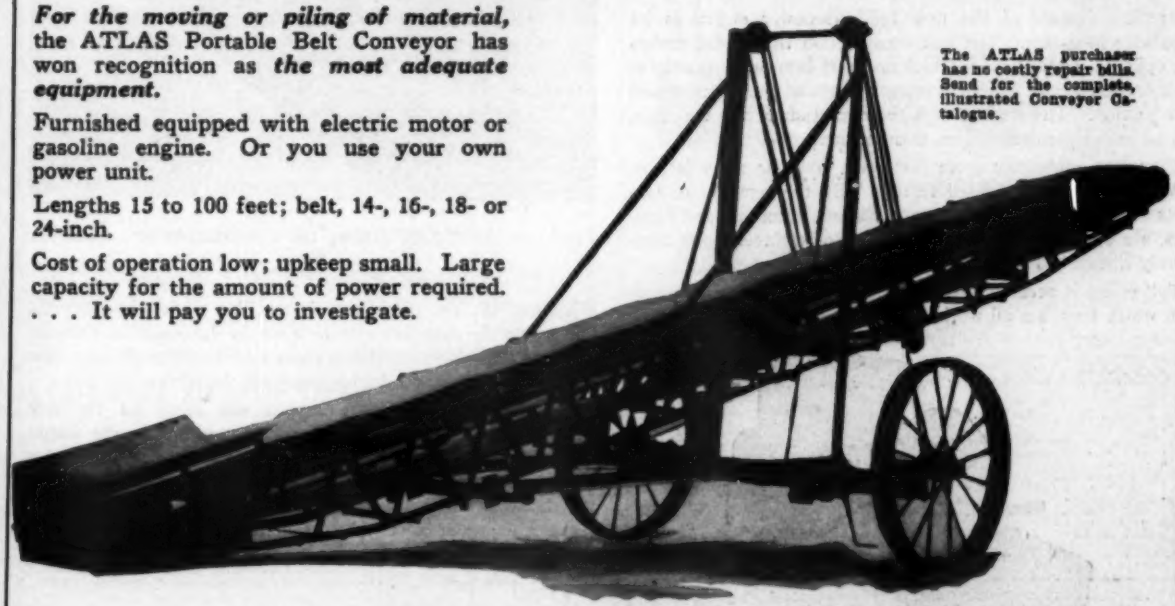
ATLAS Portable Belt CONVEYORS

For the moving or piling of material, the ATLAS Portable Belt Conveyor has won recognition as ***the most adequate equipment.***

Furnished equipped with electric motor or gasoline engine. Or you use your own power unit.

Lengths 15 to 100 feet; belt, 14-, 16-, 18- or 24-inch.

Cost of operation low; upkeep small. Large capacity for the amount of power required. . . . It will pay you to investigate.



The ATLAS purchaser has no costly repair bills. Send for the complete, illustrated Conveyor Catalogue.

ATLAS ENGINEERING COMPANY

Box "N" *Manufacturers of Bucket Elevators—Loaders—Tractors, Etc.* Branch Office

Clintonville, Wisconsin **Milwaukee, Wisconsin**

The Totally-Enclosed 1½-Horsepower Fairbanks Morse Engine

An All-Enclosed Self-Oiling Portable Engine

A NEW line of gasoline-kerosene engines in ratings from 1½ to 7½-horsepower which include a number of new features has recently been announced by Fairbanks, Morse & Co., 900 South Wabash Avenue, Chicago, Ill. While the most outstanding feature of these new engines is the all enclosed self-oiling feature, they are quite different in appearance from other small engines of this type.

The 1½-horsepower rating, a size used in a wide diversity of drives such as portable pumps, air compressors, generator saws, grinders, polishers and similar uses, is one of the new developments of this line. The engine is less than 16 inches high, 22 inches long and 19 inches wide and weighs 150 pounds. Two pulleys are provided, one of which operates at the engine speed of 1,500 r.p.m. and the other 750 r.p.m. There is also a mechanical regulator which permits slowing the engine down to 1,100 r.p.m. with, of course, proportionate reduction in horsepower.

Another feature of the new 1½-horsepower engine is its simplicity in design. The unit construction throughout makes the cylinder, water hopper, crankcase and bearing supports for both crankcase and camshaft integral parts of the cylinder and case casting. The engine, with the exception of the magneto, can be entirely assembled on this casting.

Complete protection from dirt, dust, rain or snow is provided by the fully-enclosed feature. By the removal of two bolts all working parts, such as crankshaft, camshaft and bearings, are open to inspection. Removal of eighteen bolts completely dismantles the entire engine.

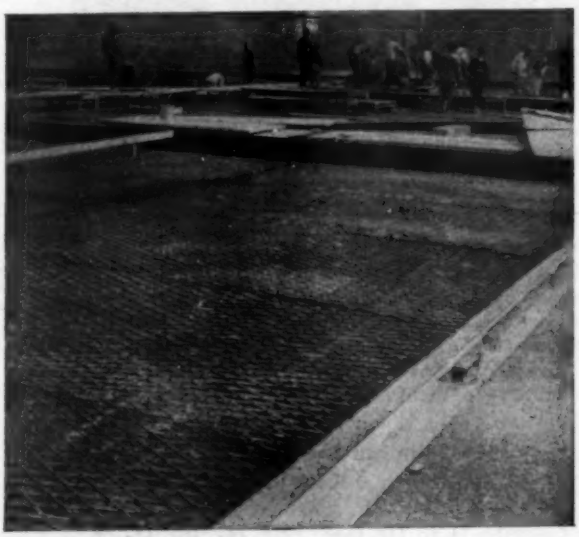
Self-oiling is accomplished through a special lubricating system which drenches all working parts in oil. The base casting serves as an oil reservoir and the bearing caps have cups to collect the oil which drips from special baffles located directly above on the crankcase cover. Another feature is the method by which leaking of oil is prevented. Felt retainers on the crankshaft and camshaft, return oil grooves on these shafts and a special crankcase breather eliminates the possibility of leaking oil. The crankcase breather also does away with compression in the crankcase. Instead of forcing the oil out at the gaskets, the breather sucks in all oil collected at the gaskets by maintaining a vacuum within the crankcase.

The Fairbanks Morse Engine With All Working Parts Exposed

Reinforcement for Concrete Floors Laid on the Ground

THE problem of reinforcing concrete floors laid on the ground has been one of considerable interest to builders and contractors. A concrete ground floor cracks, either by expansion and contraction or by the setttling of the subgrade or excessive superimposed concentrated loading. In order to protect concrete floors from cracks and subsequent deterioration, some kind of reinforcement must be provided.

Steel mesh made in mats for this purpose is manufactured by the Consolidated Expanded Metal Co., Steelcrete Bldg., Wheeling, W. Va. Steelcrete is machine made, thus insuring uniformity in structure. It is made in flat mats so that the reinforcement can be laid in a plane and it can be placed as the mixing progresses without holding back the work.



Steelcrete Being Laid During the Construction of a Concrete Floor

The separate sheets are lapped one mesh on the side and one or more meshes on the end, according to the weight of the metal used and other conditions, and wired together with annealed tie wire at a sufficient number of points to hold the sheets in position while depositing the concrete. The reinforcement is placed one inch from the top of the slab in one course work and between the top and bottom courses in the case of two course work.

New Chief Engineer for Federal Bridge Co.

THOMAS H. ANDREWS has been appointed Chief Engineer of the Federal Bridge Co., of 46 Cedar Street, New York City. Mr. Andrews was formerly with the Mexican Highway Commission and the State Highway Commissions of North Carolina and Florida.

Where weight counts most

Time and again you see WILLIAMS Buckets dig in and stand up in work that stops other buckets, because—

The WILLIAMS is more ruggedly constructed throughout—with the weight not simply hung on, but built right into the bucket where it adds Strength and Durability as well as Digging Power.

Write for our Bulletin "C" describing the new line of WILLIAMS Champion Buckets

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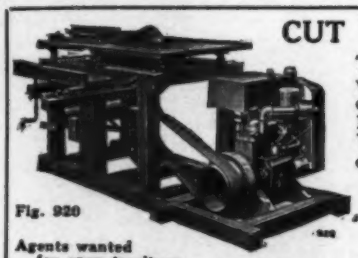

Fig. 920

Agents wanted for open territory

This portable woodworker often saves its cost on a single job. 14 machines in one. Your own shop right on the job. Quick work at less cost. Cut your bids—win more jobs. Ask about our saw rigs and hoists.

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Wage Scale by Hours and Half-Hours from 1c. to $1.00

Contains 40,200 Computations
Rapid — Accurate

No brain work—No time lost—No mistakes. Invaluable to Paymasters, Railroad Contractors, Factories, Shops, etc.—in fact wherever wages are paid. Leatherette binding—postpaid anywhere in U. S. A., $3.00.

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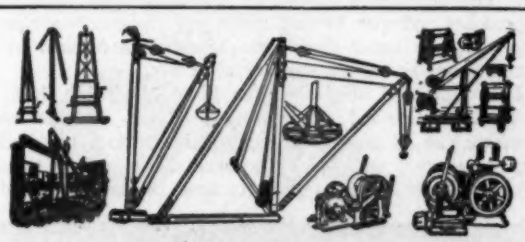
HOISTING BLOCKS
* STAR BRAND *

Are Always Reliable

Made for
Every Condition of Service
Sold by
Leading Supply Houses

Let us help you with your problems

BOSTON & LOCKPORT BLOCK CO.
NEW YORK BOSTON CHICAGO



We have a complete line of Derricks and Winches

SASGEN DERRICK CO.
3101 Grand Ave. Chicago, Ill.

CUT OUT 20% OF OPERATING COST!

Cure "batch" troubles by accurate timing of your concrete mixer. Check performance of pump for valve condition. Time conveyors and machinery. Discover "lost motion" leaks.

Proper use of the "Pastor" combination watch and stop watch will do it. Every contractor should carry one. Used by the U. S. Government after tests proved it the most durable stop watch made, regardless of price! Unbreakable crystal, nickel finish.

Fully Guaranteed!

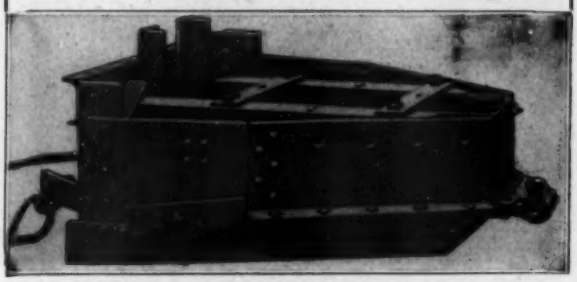
STERLING STOP WATCH CO.
Department C
15 East 26th Street New York City

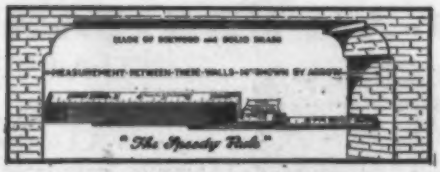
SENT C.O.D.
Price $9.95

POWER DRAG SCRAPERS

Write for our catalog on all types of Gravel and Excavating Equipment

L. P. GREEN
564 Monadnock Bldg., Chicago, Ill.





The Interlox Sliding Rule

A Sliding Rule for Contractors and Engineers

A NEW sliding rule, known as the Interlox Master slide rule, which is a combination of two rules in one, is made by the Master Rule Manufacturing Co., 815 East 136th Street, New York. This rule is marked on one side like an ordinary rule, and the other side is marked for direct reading like an inside caliper rule. It is jointed, with an automatic locking device, and is also sliding so that the rule may be extended to fit the inside of an opening and then locked to fit, and the reading taken at once from the inside of the rule.

These rules are made in feet, inches and meters in sizes from 2 to 8 feet and 1, 1½ and 2 meters. They are especially designed for engineers, architects, contractors and others who are required to obtain accurate measurements, particularly in places or positions which are awkward or difficult.

A New Asphalt Planking

AN asphalt planking which is a block-like cellular asphaltic composition made of saturated felt, asbestos fiber and springy linear fiber together with a mineral aggregate and formed under pressure by extrusion is manufactured by the Servicised Products Corp., 53 West Jackson Blvd., Chicago, Ill. This planking is suitable for use on bridges, viaducts, or approaches and may be laid under any climatic condition, is impervious to water, does not corrugate, is resilient at all temperatures and is not slippery when wet.

It is fabricated in planks from ½ to 2½ inches thick, up to 12 inches wide and in lengths up to 10 feet. This Servicised planking can be applied to any suitable surface to which it can be secured and which furnishes the necessary support. When laid over a concrete deck or floor, the surface should be dried and cleaned, then a surface of hot asphalt applied. The plank should be laid down immediately in this hot asphalt, driven up tight, weighted down and allowed to set. The planking may be laid at right angles or at an angle of 45 degrees to the flow of traffic. All joints are sealed with hot asphalt.

When used over a wood deck or floor, a suitable asphalt saturated felt is laid and mopped with asphalt. The planks are then placed and nailed down, the spikes driven ¼-inch below the plank surface. All spaces and cracks are filled with hot asphalt.

Laying the New Servicised Asphalt Planking

A New Type of Tank Car Heater

A TANK car heater built on an entirely new principle has been developed by C. C. Plumb, 150 Toronto Avenue, Providence, R. I. In this heater the oil bath is discarded because under direct heat oil carbonizes too readily and reduces the effectiveness of the system. In the Plumb tank, a mineral bath is used with a grate fire. The bath extends two inches below the grate level, thus doing away with the need of fire brick to protect the wall of the bath. The mineral bath is carried through a 165-gallon tank of oil in two coils. The oil from the tank is pumped by a Viking pump with 1¼-inch suction and discharge to the heating coils within the tank car. The oil is pumped at a temperature of between 600 and 725 degrees Fahrenheit and it returns at about 300 to 450 degrees. The temperature of the oil being pumped to the car is controlled by the variable pump, which is operated by a 2-cylinder LeRoi engine.

The Plumb Tank Car Heater Mounted on a Trailer

The entire tank unit is insulated with locomotive-type steel and mineral wool and is mounted on a 3-ton trailer, or, if desired, on a motor truck.

The operating cost of this unit, according to the manufacturer, runs about one-third the cost of operating a steam boiler. Inasmuch as there is practically no depreciation in the mineral bath and the oil loss on making connections and breaking connections to the tank are a minimum, the capital expense is not increased. Additional oil for the tank is sold by the agent at cost.

The tank proper is built of boilerplate steel and no pressure is built up within the machine, which does away with the need of a licensed operator and there is no water to look after.

The Plumb tank car heater is sold by George E. Pearson, 11 Beacon Street, Boston, Mass.

HUBER 4 CYLINDER MOTOR ROLLERS

POWERFUL AND DEPENDABLE AS STEAM
EASY TO HANDLE
SINGLE LEVER CONTROL

MADE IN FOUR SIZES
5-7-10-12 tons

SEND FOR
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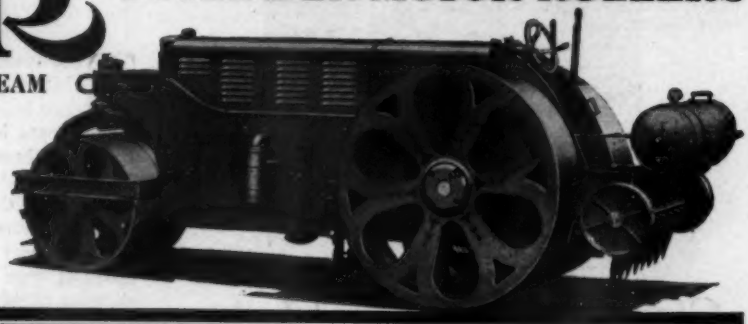


330 E. CENTER ST. THE HUBER MANUFACTURING CO. MARION, OHIO

Driven by the Turbine Air Motor—the lightest, fastest and most economical motor in existence

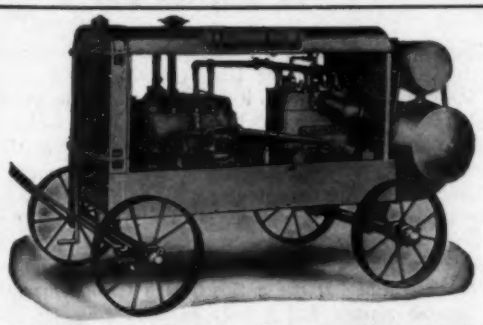
ENGINEERS ASKED FOR THE "F-4" TURBINE AIR CONCRETE SURFACER

A Heavy Duty Surfacer of High Cutting Speed, for Production Work

It is light and portable. We recommend this machine for rough work or for exceedingly hard concrete with the Steel Cutter Head for roughing and the Coarse-Stone for producing the final finish.

Ask about our other Concrete Surfacers

THE TOUSLEY TOOL CO.
1965 East 66th Street, N. E. Cleveland, Ohio



Furnished in two sizes; with piston displacements of 120, and 240 cubic feet of free air

Free running engine clutch—balanced crankshaft—force-feed oiling system

PUT AN
O-K
COMPRESSOR
on your job and
speed-up your work

O. K. CLUTCH & MACHINERY CO.
COLUMBIA PENNSYLVANIA

THE ONE-MAN SCRAPER THAT MOVES
MUCH EARTH WITH LITTLE EFFORT

Schaefer CLEVELAND

Have you a one-man scraper?

Will it load, dump, spread and level?

Are all of these operations easily controlled from the drivers' seat? What about the upkeep cost? Is it low?

If you can't answer "YES" to all of these questions, you need the SCHAEFER Automatic One-Man Tractor Scraper.

Schaefer CLEVELAND

Leading the market since 1921, the SCHAEFER One-Man Tractor Scraper is preferred by thousands of earth-movers. It is a practical tool of proven worth. Used the world over.

Furnished with or without Auxiliary Back-up Control. Four stock sizes: Scraper width, 4, 5, 6 and 7 feet.

Write for our circulars

4180 LORAIN AVE. The Gustav Schaefer Company CLEVELAND, OHIO

A Schofield-Burkett Standard Bucket

Cleaning Ponds and Lakes

MANY municipalities and industrial enterprises are faced with the problem of cleaning ponds, reservoirs, lakes and other bodies of water of accumulations of sediment and organic matter. The Schofield-Burkett Construction Co., Macon, Ga., has developed a solution for this problem where the span is not over 600 to 900 feet, and without reducing the volume of water in the area to be cleaned. Under patents recently granted, governing an automatic snubbing and shifting device, the Schofield-Burkett Co., can work out a triangular area in which the base of the triangle is equal to two-thirds of the span.

Instead of using the standard Schofield-Burkett bucket with automatic digging features, a hood is placed on the bucket with excellent results, giving the full effect to the digging principle, but not allowing the material dug to float over the top and back of the bucket and allowing the bucket to accumulate its load and carry it to its destination. For a job of this type at Ashville, N. C., over a span of 400 feet across the French Broad River, it was possible to anchor the base line on the opposite bank of the river to the delivery point, but where the volume of water is too wide to permit a cable to be anchored on land, it is possible to anchor the base line in the water and accomplish the same results.

One of these machines is now at work cleaning out the mill pond for a large cotton mill in central Georgia. In this particular case the pond was drained and an attempt made to clean it with mules and scrapers, but the sedimentary deposit was so soft that the mules bogged down and the attempt failed. The Schofield-Burkett Co., was consulted and a machine was installed with the result that the muck is being cleaned out and used as a fertilizer for a mill village playground.

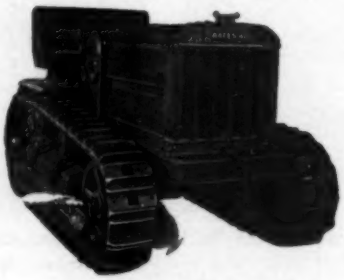
By using the patented digging bucket and snubbing and shifting device, one man can operate an electric installation sending his bucket out to any point in the triangular area he desires. The shifting arrangement is unique and where the span is 900 feet one man at one setting of the machine can clean a triangular area with a span of 900 feet and a base of 600 feet.

Contractors find in the use of this machine a new and fertile field for their endeavors as they may enter bids for cleaning municipal reservoirs and lakes, industrial plant cooling ponds and streams supplying condenser water to large power plants.

A Sturdy and Heavy Duty Tractor

THE main features required in a tractor are power, easy handling, economical operation and durability. A sturdy and heavy duty tractor which is designed to meet these requirements is the Bates Steel Mule, manufactured by the Foote Brothers Gear & Machine Co., Road Machinery Div., 111 N. Canal Street, Chicago, Ill. These tractors, which are made in three sizes, have a specially constructed drawbar which converts part of the pull into a downward force and thus increases the tractive power. The drawbar is of the swinging type equipped with a spring shock absorber. The drawbar extends from the rear of the tractor resting between two heavy crossbars. The holes across both bars at equal intervals make it possible to insert heavy pins and hold the drawbar in any desired position.

The Bates Steel Mule is built broad and with a low center of gravity. The equalizing bar between the frame and the crawlers distributes the weight forward and evenly on both crawlers. The crawlers have a large traction surface and are so placed that they protect the radiator.



The Bates Steel Mule

The steering clutches are encased in a dry compartment which is oil tight and the large capacity brakes controlling the steering clutches makes it possible to turn the tractor in a small space. The brakes and clutches are independently controlled, allowing one crawler to stand still while the other moves.

A 4-cylinder Waukesha motor of the medium speed, heavy duty type furnishes the power for this tractor. The motor is built with detachable chrome nickel iron cylinders and heads cast in pairs. A gear-driven centrifugal pump keeps the water circulating. It has a Bosch high tension magneto with an impulse starter, and a fully enclosed governor. The full pressure oil system reaches all bearings and a special provision is made to filter the oil while circulating as well as to assure proper lubrication when the supply is running low or in cold weather.

The transmission is easily accessible, and is of the selective sliding gear type with three speeds forward and one reverse. Each crawler is driven with an independent multiple disc clutch having large diameter plates which are fitted with friction linings.

Underwater Operation of a Schofield-Burkett Loading Bucket with Special Hood Handling Sand and Gravel

The BAY-CITY family of fast workers

Model R
A 26-ton, heavy-duty, full revolving ¾-yd. shovel. Operates shovel, clamshell, dragline, trench hoe, skimmer or crane. Electric starter. E-Z clutch control. Short tail swing.

Model K
Full revolving light ½-yd. convertible shovel, crane, skimmer, dragline trencher. Short tail swing. Perfect stability—no rocking on center pin. Weight, 13 tons.

Tractor Shovel
Recognized leader in its field. Operates shovel, trench hoe, clamshell, dragline, backfiller or crane boom. Weighs 10 tons.

BAY CITY SHOVELS, Inc., Bay City, Mich.

ANOTHER of the REAL GOOD THINGS in the

DOBBIE LINE

Swivel Hook Hoisting Blocks with detachable Cheek weights.

Just the thing you have been looking for to use with that Truck Crane—Crawler Crane or Derrick.

DOBBIE also manufactures a complete line of Derrick Fittings, Ball and Roller Bearing Sheave Blocks and Mast Footblocks—Hand Winches for every purpose, Capacities 100 to 50,000 pounds.

Write for Catalog Describing

DERRICKS, Steel and Wood, Stiff Leg and Guy

DOBBIE FOUNDRY & MACHINE CO.
Niagara Falls, N. Y.

Complete Stock Carried at Niagara Falls—
Also G. S. Green Co., 74 Warren Street New York City, N. Y.

LAKEWOOD PAVING EQUIPMENT

A Smooth Surface

It's the Tilted Screed that Does It!

That troweling action, whereby pressure is applied to the "heel" of the Lakewood Screed Board, insures a smooth, even road surface.
There is nothing complicated or mysterious about it. The Lakewood Screed operates just the same as you would use a hand trowel. The front edge of the screed board is tilted slightly. As the machine moves forward the tilt of the screed board compresses the concrete, at the same time striking off at just the proper level. The natural result is a greatly improved surfacing action.

There are many other exclusive advantages in this improved Screed, explained in detail in our Bulletin 47-M

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LAKEWOOD
The Lakewood Engineering Co. CLEVELAND · O.

All About Wet Concrete Handling

on such jobs as

Buildings
Retaining Walls
Viaducts
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R. R. Elevations
Elevated Drives
Irrigation Ditches
Bridges
Locks

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B-G Portable Belt Conveyors

New ideas—new set-ups—for handling wet concrete from the mixer to the forms with B-G Portable Belt Conveyors are detailed in the new wet concrete book—"New Applications and Set-Ups." Send the coupon for your copy.

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Company.....
City..... State.....

BARBER-GREENE COMPANY
485 West Park Ave., Aurora, Ill.

BARBER GREENE

SULLIVAN

Spader WINS in "blindfold test"

HOAG and ROLLINS were tunnelling under the Maumee River at Toledo. They knew air clay diggers could beat hand labor. They didn't know which diggers were speediest.

So they tried a "blindfold test." Four men in the heading got four different clay spades. Clay spattered over the names. The men exchanged tools. When the shift came out of the hole—the superintendent asked which spade they wanted.

All voted for the same tool. The superintendent scraped off the clay and recorded the name "SULLIVAN." After one week of testing the contractors standardized on SULLIVAN Spaders.

SULLIVAN Spaders are hard on clay, but easy on men. They are balanced, smooth-running, and powerful. Your men, too, will like them.

Send for Catalog 3981-N

SULLIVAN MACHINERY COMPANY

814 WRIGLEY BUILDING, CHICAGO

BAKER MANEY

Self Loading Scrapers

The original self-loading scrapers continue to show their ability to move large quantities of dirt with two to three men. They dig, load, haul, dump and compact the dirt as a single outfit.

They are available in three sizes—¾-, 1- and 1½-cubic yard capacities to suit your job or your tractors.

Write for these Baker Bulletins

Bulletin No. 263—Baker Maney Scrapers ☐
Bulletin No. 256—Baker Rotary Scrapers ☐
Bulletin No. 270—Baker Road Maintainers ☐

THE BAKER MANUFACTURING CO.

585 Stanford Ave. Springfield, Ill.

CONTRACTORS WILL FIND THESE CATALOGS USEFUL

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A 15-HORSEPOWER HOIST

Catalog O, describing the new Brown Model-20 15-horsepower hoists which are especially adapted for average size building operations and fit into a wide variety of jobs, may be secured from the Brown Clutch Co. (Oliver F. Rinderle, Pres.), Sandusky, Ohio.

NEW TYPE OF BLOW TORCH

A new blow torch known as the Sprayit blow torch which does not need pumping, priming or pre-heating has been announced by the Electric Sprayit Co., Inc., South Bend, Ind., for burning common kerosene, and is said to produce 30 per cent more heat with a lower price fuel.

POWER OPERATOR FOR CONCRETE PAVER

A new system of paver control which is intended to make possible the advantages of automatic operation and at the same time overcome the disadvantages which arise from a rigidly fixed operating cycle by enabling the operator to coordinate the mixing cycle with other operations, has been announced by the Foote Co. (R. E. Brooks, Vice Pres.), Nunda, N. Y., as a feature of the 1929 Multi-Foote paver, complete information regarding which may be secured on request.

A NEW PORTABLE PNEUMATIC SHEETING DRIVER

The Chicago Pneumatic Tool Co. (H. H. Sherman, Mgr., Publicity Dept.), 6 East 44th Street, New York, will be glad to send to those interested complete information in regard to the recently developed CP-116 sheeting driver, which is low in air consumption, of the valveless type, with only one moving part, is symmetrical and light enough for ready portability and use as a one-man tool.

CURING CONCRETE

The Philadelphia Quartz Co., 121 South Third Street, Philadelphia, Pa., will be glad to send to those interested recent literature describing the curing of concrete roads with silicate of soda.

A NEW ASPHALT PLANKING

An asphalt planking, which is of block-like cellular asphaltic composition made of saturated felt, asbestos fiber and springy linear fiber together with a mineral aggregate and formed under pressure by extrusion, is described in literature which may be secured from the Servicised Products Corp. (A. C. Fisher, Pres.), 53 West Jackson Blvd., Chicago, Ill.

NEW FORM TIES FOR BRIDGE PIERS

Bosco ties and clamps for bridge piers, abutments and retaining walls are described in literature which may be secured from the Fischer & Hayes Rope & Steel Co. (C. A. Kemper, Sales Mgr.), 842-844 West Erie Street, Chicago, Ill.

A NEW REINFORCING PLASTER BASE

Complete information in regard to the new ribbed Steeltex, a reinforcing plaster base which is strong and rigid and yet may be cut with ordinary hand shears and bent to fit the material in corners or on curved surfaces, may be secured from the National Steel Fabric Co. (E. L. Benedict, Gen. Sales Mgr.), Union Arcade Bldg., Box 72, Pittsburgh, Pa.

A LIGHT MODEL DRILL SHARPENER

Bulletin No. 72-N describing the Sullivan light model drill sharpener for work on hammer drill bits and shanks for the lighter drills, utilizing ⅞-inch to 1-inch steel, and also useful for making pick and chisel point bits for concrete breakers and similar tools, may be secured from the Sullivan Machinery Co. (S. B. King, Adv. Mgr.), 814 Wrigley Bldg., Chicago, Ill.

WAGE SCALE BY HOURS AND HALF HOURS

A complete description of Haring's Paymaster wage scale by hours and half-hours, which contains 40,200 computations and is of special interest to contractors, superintendents, paymasters and all who pay wages, may be secured from C. B. Marquis, 2216 North Sixth Street, Clinton, Iowa.

CALCIUM CHLORIDE FOR DIRT AND GRAVEL ROADS

Information in regard to 3-C calcium chloride for dust prevention on dirt and gravel roads and which acts as a binder for the road surface materials, may be secured from the Columbia Products Co. (Henry W. Young, Vice Pres.), Barberton, Ohio.

A PORTABLE AIR COMPRESSOR

Descriptive literature on the complete line of Buhl portable air compressors in sizes of 36, 55, 90, 100, 110, 220 and 330 cubic feet displacement per minute will be sent on request to any one writing the Buhl Co. (W. I. Buhl, Gen. Mgr.), Old Colony Bldg., Chicago, Ill.

DID YOU EVER BUILD A HORSE IN 30 SECONDS?

THE TOLEDO HORSE

Just drop a piece of any 2" standard sized lumber between the jaws of two of these rigid pressed steel frames and lock the feet in an open position. Result, a complete and perfect horse, ready for use. Average elapsed time, 30 seconds.

Setting up a Toledo Horse is as simple as walking up-stairs. Locks in permanent position without springs or notches. No adjustable parts, yet ordinary thickness variations are readily accommodated.

Extreme rigidity, lasting durability and convenience of handling, make Toledo Horses ideal for highway barricades. Always ready for all general purposes, yet conveniently out of the way until wanted. Loading capacity twelve ton per pair. Available in different heights.

The frames are dismantled by a sharp upward blow on the folding brace. They fold up compactly for easy handling or storing.

The Toledo Horse is indispensable to the contractor, garage, warehouse, shop or factory. Its great utility is made available to all through its low price.

Full particulars gladly furnished.

Manufactured Only by

THE TOLEDO PRESSED STEEL CO
TOLEDO, OHIO

CLOSER SHEETING

See how close the men are working on this sandy trench being dug by Tom Scalzo at Seattle. Note the soft spoil bank.

One of the five advantages of the Parsons 40

SOIL that would ordinarily collapse under other machines, can be successfully and profitably dug with a Parsons 40. Parsons construction permits closer sheeting—right up to the boom if necessary—and the light bearing pressure of the broad traction does not endanger the sidewalls.

And whether digging is extra sandy, or extra hard, there's a real advantage in the Parsons 40 speed transmission—the direct drive that eliminates power waste—the differential gearing that makes the Parsons easier to handle—all vital reasons for the Parsons reputation of digging more dirt per dollar.

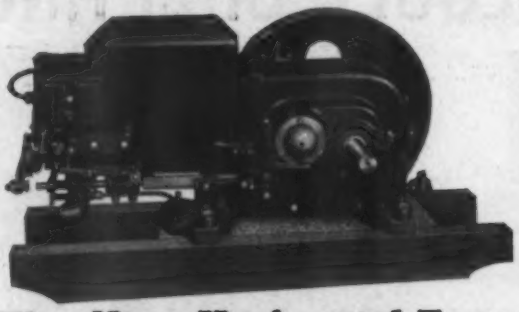
NEC

THE PARSONS COMPANY
Newton, Iowa
Division of National Equipment Corporation

PARSONS

A complete line of trenchers and backfillers

A SENSATION!



The New Horizontal-Type Completely Enclosed

STOVER ENGINE

Users and distributors of industrial power equipment proclaim the new Stover Horizontal-Type Engine a real sensation! It is completely enclosed. Automatically lubricates not only piston and cylinder, but all other moving parts, by splash system. For over half a century Stover engines have been famous for their in-built quality. This new model surpasses all others! It is moderately priced. Write today for literature describing the whole line and names of manufacturers using this new model engine on their equipment.

STOVER MFG. & ENGINE CO.
25 Lake Street
FREEPORT, ILLINOIS

FLORY
CABLEWAY EXPERTS!

FLORY through their 50 years of experience in designing and erecting cableways for some of the world's largest engineering projects, have become cableway experts.
For the construction of Bridges, Dams, etc., cableways offer a dependable and economical means of carrying materials.
Flory Engineers will gladly advise you about the adaptability of a cableway to any type of work.

S. FLORY MFG. CO., Bangor, Pa.
HOISTS, CABLEWAYS, CAR PULLERS, ETC.

CONTRACTORS WILL FIND THESE CATALOGS USEFUL

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

CHLORINATORS FOR SOLVING SEWAGE PROBLEMS
Wallace & Tiernan Co., Inc. (W. J. Orchard, Gen. Sales Mgr.), Newark, N. J., will be glad to send to those interested complete information in regard to the W & T solution feed chlorinators and also Technical Publication No. 96 describing a number of experiments in chlorination.

NEW GASOLINE POWERED LOCOMOTIVE CRANES
Thew Shovel Co. (J. L. Beltz, Adv. Mgr.), Lorain, Ohio, will be glad to send to those interested complete information in regard to the new Lorain gasoline-powered, crawler mounted locomotive cranes in 15 and 20 tons and equipped with 45 or 50-foot booms for use with 1 and 1¼-yard clamshell buckets.

A 6-CYLINDER 10-TON ROAD ROLLER
A bulletin describing the Ames 6-cylinder, 10-ton road roller may be secured by those interested from the Ames Iron Works (A. Bradley, Sales Engr.), Oswego, N. Y.

A NEW DIAPHRAGM PUMP
A description of the new Novo 21-C closed top diaphragm pump which is mounted on rubber-tired trailers to facilitate transportation may be secured from the Novo Engine Co. (W. C. Horn, Adv. Mgr.), 216 Porter Street, Lansing, Mich.

A SELF-LOADING TWO-WHEEL SCRAPER
The Highway Trailer Co. (H. W. Helms, Gen. Mgr.), Edgerton, Wis., will be glad to send to those interested its folder describing the Highway trailer scraper which is a self-loading, one-man scraper unit, ranging in capacities from 2 to 5½ cubic yards.

HOISTS FOR ELEVATOR WORK
Lidgerwood Manufacturing Co. (F. D. Hooper, Sales Mgr.), Elizabeth, N. J., will send to those interested complete information in regard to the Lidgerwood high speed hoists made in 12 sizes and designed for elevator work.

EXCAVATING FOR PROFIT
A 55-page booklet with this title, describing and illustrating the Sauerman slackline cableway excavators and their many possible uses in excavating and construction jobs, may be secured from Sauerman Brothers, Inc. (Louis McLouth, Adv. Mgr.), 464 South Clinton Street, Chicago, Ill.

A NEW ROLLER IN 5, 6 AND 7-TON SIZES
The Austin Cadet pup-roller, which is made in 5, 6 and 7-ton sizes and has a wheel base of 8 feet 11¼ inches and may be fitted with a front planing blade or a pneumatic scarifier, is described in literature which may be secured from the Austin-Western Road Machinery Co. (H. F. Barrows, Adv. Mgr.), 400 North Michigan Avenue, Chicago, Ill.

CLEARING ROADS
This is the title of a recent folder describing the use of Caterpillar tractors and Russell graders in clearing and road building which may be secured from the Caterpillar Tractor Co. (W. H. Gardner, Adv. Mgr.), San Leandro, Calif.

A POWER DRAG SCRAPER
A 16-page booklet describing the use and application of Green power drag scrapers to a variety of jobs may be secured from the L. P. Green Co., 53 West Jackson Blvd., Chicago, Ill.

A STURDY AND HEAVY DUTY TRACTOR
A booklet describing Bates Steel Mule tractors, made in three sizes and specially designed for power, easy handling, economical operation and durability, may be secured from Foote Brothers Gear & Machine Co. (E. A. Emmons, Adv. Mgr.), 215 North Curtis Street, Chicago, Ill.

NAILER JOISTS FOR LIGHT OCCUPANCY BUILDINGS
Catalog No. 607 containing details, designing data and safe loading tables for the new welded steel Truscon nailer joists for use in the construction of light occupancy buildings may be secured from the Truscon Steel Co. (Oscar W. Loew, Dir., Adv. and Sales Promotion), Youngstown, Ohio.

MAGNETOS FOR CONSTRUCTION EQUIPMENT
A complete description of the Eisemann magneto for use in construction equipment will be furnished on request by the Eisemann Magneto Co. (E. S. Clark, Adv. Mgr.), 165 Broadway, New York.

A NEW MULTI-POWER CLAMSHELL BUCKET
The Erie Steel Construction Co. (R. E. Daub, Adv. Mgr.), Erie, Pa., will be glad to send to any one interested complete information and prices of the new Erie multi-power clamshell bucket.

They Dominate The ROLLER FIELD

From Coast to Coast

It is because of BUFFALO-SPRINGFIELD'S reputation for superior performance? Or because there is a BUFFALO-SPRINGFIELD ROLLER for every special or general requirement? Or because of the prestige, goodwill and confidence built up during many years of outstanding service? Whatever the reason—that they are preferred the country over is an established fact.

Full range of sizes in latest models, with or without scarifier or other attachments.

The BUFFALO-SPRINGFIELD ROLLER CO.
Springfield, Ohio

TRENCH WITH DRY WALLS AND BOTTOM 21 FEET BELOW WATER LEVEL

Absolutely dry trench—21 ft. below water level!

DOMESTIC

DRAINAGE SYSTEMS AND PUMPS DID THE TRICK

To lay pipe in water-soaked sand 21 feet below water level is usually a difficult job—but—"DOMESTIC" Pumps and "DOMESTIC" Point Drainage gave firm sides and dry bottom trench on this job at Gary, Indiana.

If your job requires the drying-up of specified areas for trench work, foundation work, etc., in water soaked-soils, our Bulletin No. 288 will interest you. This "copyrighted" illustrated booklet contains much data of real value to every Engineer and Contractor. A copy is yours FREE—for the asking.

"DOMESTIC" DRAINAGE SYSTEMS

give

Safety, Speed and Profits

on jobs below the surface of water saturated soils

SPECIAL DOUBLE PLUNGER PUMP Successfully used with "DOMESTIC" Drainage Point Systems

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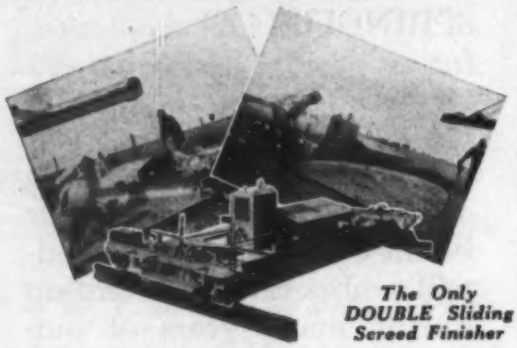
Right on Top of the Mixer All of the Time

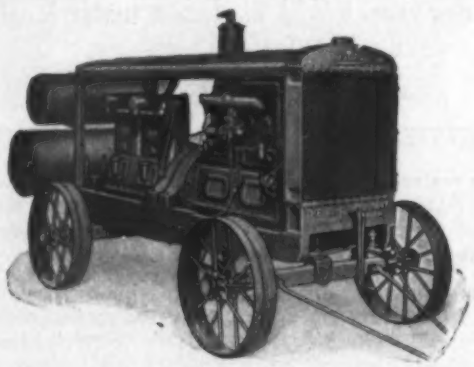


The Only DOUBLE Sliding Screed Finisher

Where real records are being made in concrete road building, there you will find the ***ORD Road Finishing Machine,*** crowding the mixer, no matter how many batches are being handled. And in addition to speed, there is a slab and surface quality that wins instant approval.

Write for New Bulletin

A. W. FRENCH & CO.
DIVISION OF BLAW-KNOX CO.
Manufacturers of the ORD Concrete Road Finisher
8524 Vincennes Ave. Chicago, Ill.



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Leading contractors, railroads, public utilities, municipalities and industrial concerns everywhere are using BUHL Portable Air Compressors because they embody improvements that are "Years Ahead" and result in greatly reduced production costs of compressed air.

The BUHL Line offers the widest possible selection of portable compressors in sizes 36, 55, 90, 100, 110, 220 and 330 cubic feet displacement with any type of mounting desired.

Descriptive literature on request.

THE Buhl COMPANY
Old Colony Bldg., Chicago
Sales Branches in All Principal Cities

CONTRACTORS WILL FIND THESE CATALOGS USEFUL

These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A NEW HYDRAULIC BULLDOZER
Complete information in regard to the new steel, electrically welded Ateco hydraulic bulldozer, consisting of a heavily reinforced bowl or blade extending across the front of the tractor and attached on either side, may be secured from the American Tractor Equipment Co., Oakland, Calif.

AN ALL-ENCLOSED SELF-OILING PORTABLE ENGINE
Complete information in regard to the new line of gasoline-kerosene engines in ratings from 1½ to 7½-horsepower and including a new all-enclosed self-oiling feature, may be secured from Fairbanks, Morse & Co. (S. T. Seofield, Adv. Mgr.), 900 South Wabash Ave., Chicago, Ill.

NEW TRUCK CRANES WITH ADDITIONAL CAPACITY
Bulletin 62 describing the new Model-A Orton truck crane, which includes among its features, additional capacity, speedy operation, ready control and lengthy service, and which can be mounted on any 5 or 7½-ton truck, may be secured from the Orton Crane & Shovel Co. (P. A. Orton, Jr., Sales Mgr.), 608 South Dearborn Street, Chicago, Ill.

ROAD BUILDING MACHINERY
Recent bulletins describing the complete line of road building machinery, including Warco E and ER graders, crawlers, scoops and rollers, may be secured on request from the W. A. Riddell Co. (Carl F. Ebert, Adv. Mgr.), Bucyrus, Ohio.

A 64-PAGE BOOKLET ON POWER SHOVELS
A new 64-page booklet describing the Bucyrus-Erie Gas+Air crane-shovel-dragline and the records it has made may be secured by those interested from Bucyrus-Erie Co. (F. O. Wyse, Asst. Adv. Mgr.), South Milwaukee, Wis.

PORTABLE RIG SAWS
Bulletin 178 contains a complete description of the Rex portable rig saws which have a large cutting capacity with more kinds of cuts and easy operation and may be secured from the Chain Belt Co. (R. A. Shilbauer, Asst. Adv. Mgr.), 766 Park Street, Milwaukee, Wis.

BUCKETS FOR ALL USES
Complete information in regard to the Blaw-Knox Dreadnaught buckets which are made in all sizes and styles to meet every possible need is contained in the booklet "Dreadnaught" which may be secured from Blaw-Knox Co. (D. Clinton Grove, Adv. Mgr.), 667 Farmers Bank Bldg., Pittsburgh, Pa.

A SERVICEABLE CONTRACTORS' PUMP
A catalog describing the Humdinger contractors' pump, which handles unusually large percentages of mud and sand, has quick pick-up and high suction lifts and is built for years of service, may be secured from the Ralph Carter Co., Hackensack, N. J.

CAST IRON PIPE
Complete data and prices on the Universal cast iron pipe may be secured from the Central Foundry Co., 420 Lexington Avenue, New York.

PORTABLE WOOD WORKING MACHINERY
Complete data and prices on a serviceable line of portable woodworking machinery, including band saws and saw rigs, may be secured from the American Saw Mill Machinery Co. (W. E. Swanger, Mgr.), 171 Main Street, Hackettstown, N. J.

WIRE FABRIC FOR CONCRETE
A new Road Book, describing in detail the triangle mesh or electric welded wire fabric of cold drawn steel for reinforcing concrete, will be sent on request by the American Steel & Wire Co. (Wilmer H. Cordes, Mgr. Adv. Dept.), 208 South LaSalle Street, Chicago, Ill.

CAST IRON PIPE FOR DRAINAGE USE
The Armco Culvert Manufacturers Assn. (Anton S. Rosing, Publicity Mgr.), Middletown, Ohio, will be glad to send to those interested complete information in regard to the Armco cast iron pipe, made of uniform and carefully analyzed Armco Ingot Iron.

A NEW LIGHT ½-YARD SHOVEL
Bulletin K-1 describing the new Model K ½-yard shovel which is convertible to a skimmer, dragline, crane or trencher and is full revolving, may be secured from Bay City Shovels, Inc. (W. S. Ramsay, Pres.), Bay City, Mich.

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To produce a bin of the best possible engineering design and enduring qualities, Beaumont Bins are built entirely of copper bearing steel plate. They are the only bins on the market with this feature.

9 big features

1. Constructed of copper bearing steel plates which insures the bin lasting two to three times as long as ordinary steel bins.
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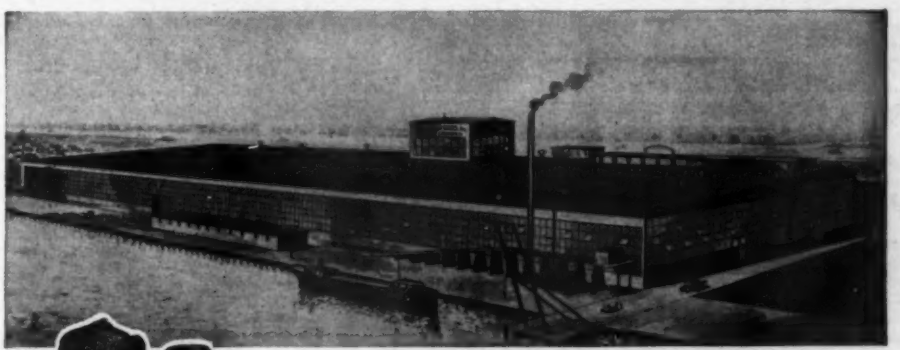

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Johnston Boilers have proven their value on engineering projects the world over. They are built by an organization that has been building good boilers for over 65 years. When you have a boiler problem you may find our experience worth while. Call on us then.

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Specializing in Boilers for Contractors' Equipment

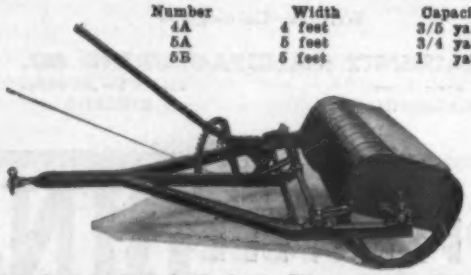
Built to Stand the Gaff
The
"GROUNDHOG"
REVOLVING TRACTOR SCRAPER

A stout, two-fisted, hard-hitting outfit that does the work where others fail. Saves time, effort and money. Loads and spreads or dumps continuously under forward draft—no stopping—no time lost. Depth of cut under instant control. Adjustable to all conditions.

Write for Information

THE RODERICK LEAN COMPANY
Dept. 9 **Mansfield, Ohio**

Number	Width	Capacity
4A	4 feet	3/5 yard
5A	5 feet	3/4 yard
5B	5 feet	1 yard



A long lever regulates depth of cut. Bites as deep as desired and stops loading instantly. No stalling, no over-loading. A simple and positive control for loading, dumping and spreading.

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Open new pavements in half the time with Dowflake—Eliminate slow, costly ponding. Minimize surface cleavage, voids and pitting—by using Dowflake Calcium Chloride as your concrete curing agent and accelerator.

Dowflake, added to the mix in the form of a solution, permeates uniformly and insures even curing. The admixture method of using Dowflake is a most efficient, economical and simple method of insuring uniformly cured pavements that can safely be opened to heavy traffic in half the time usually required when other curing operations are used.

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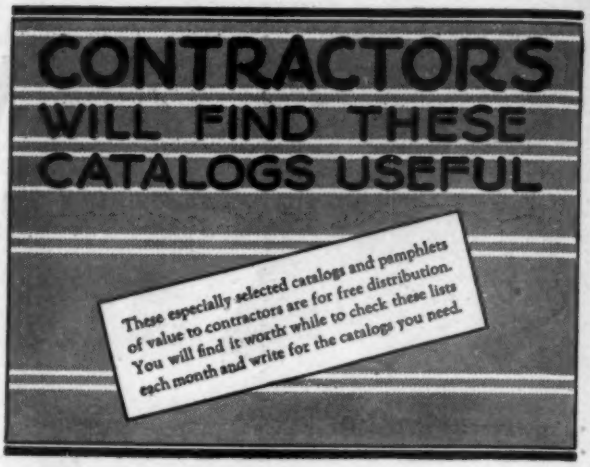

CONTRACTORS
WILL FIND THESE
CATALOGS USEFUL
These especially selected catalogs and pamphlets of value to contractors are for free distribution. You will find it worth while to check these lists each month and write for the catalogs you need.

A PORTABLE SELF-PRIMING CENTRIFUGAL PUMP
The Homelite portable self-priming pump, weighing only 75 pounds and pumping up to 6,000 gallons an hour, is described in literature which may be secured from the Homelite Corp. (W. S. Mauger, Sales Mgr.), 71 Riverdale Avenue, Port Chester, N. Y.

A NARROW-FRONT MEASURING-TRAY WHEELBARROW
The narrow-front measuring-tray wheelbarrow which places materials exactly where they are desired, levels off to measure an accurate quantity and comes in five sizes graduated at half cubic foot intervals is described in a catalog which may be secured from the General Wheelbarrow Co. (W. A. Gordon, Sales Mgr.), 3140 East 55th Street, Cleveland, Ohio.

SELF-FEEDING LOADERS
The Geo. Haiss Manufacturing Co. (A. W. Haiss, Pres.), 142nd Street and Park Avenue, New York, will be glad to send to those interested complete information in regard to the Haiss loaders which are equipped with the exclusive Haiss feeder.

AN AIR-OPERATED CONCRETE SURFACER
A catalog describing the No. 7-A turbine air concrete surfacer, a small, light, fast-cutting, high-powered machine for close corners and for scaffold work may be secured from the Tousley Tool Co. (William E. Tousley, Pres.), 1965 East 66th Street, N. E., Cleveland, Ohio.

DIAPHRAGM AND CENTRIFUGAL PUMPING OUTFITS
Trench, marine, diaphragm and centrifugal pumping units for every purpose and designed for long hard service, are described in literature which may be secured from the Trench & Marine Pump Co., 126 West 22nd Street, New York.

A HANDBOOK OF DELAVAUD PIPE
A handbook of deLavaud pipe, containing complete information in regard to the pipe and also a fund of valuable data including dimension tables, weights and types of joints, may be secured from the United States Pipe & Foundry Co. (John D. Capron, Publicity Mgr.), Burlington, N. J.

A NEW POWER PLOW SCRAPER
A new power plow scraper which requires less power to operate, has increased digging ability, presents less resistance against the line of pull, eliminates hoist strain and prevents spillage is described in literature which may be secured from the Garst Manufacturing Co., 549 W. Randolph Street, Chicago, Ill.

EXPANSION JOINTS FOR CONCRETE ROADS
The Philip Carey Co. (Charles D. Easton, Adv. Mgr.), Lockland, Cincinnati, Ohio, will be glad to send to those interested full particulars in regard to Carey Elastite expansion joints for use in concrete roads to insure smoothness and protection of the concrete against expansion stresses and contraction strains.

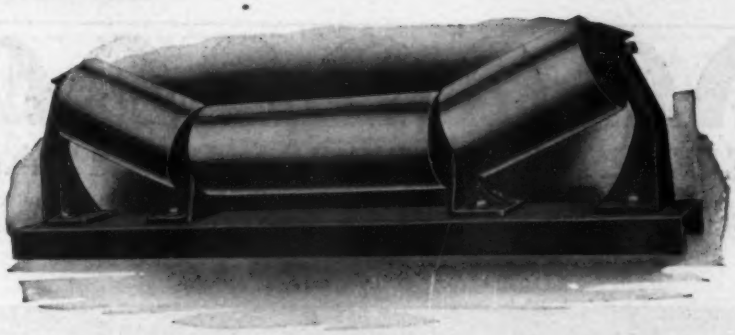
CUTTING LOADING AND UNLOADING COSTS
Bulletins describing the Chicago Automatic portable-type belt conveyors which are cutting loading and unloading costs for contractors everywhere may be secured from the Chicago Automatic Conveyor Co. (H. H. Dreyer, Adv. Mgr.), 1853 South 55th Avenue, Cicero, Ill.

STURDY AND RELIABLE TRACTORS FOR INDUSTRIAL WORK
The Cleveland Tractor Co. (H. E. Orr, Adv. Mgr.), 19321 Euclid Avenue, Cleveland, Ohio, will be glad to send to those interested full details of the complete line of Cletrac tractors for industrial work.

A HOIST FOR EVERY PURPOSE
A complete description of Clyde gasoline hoists, which are dependable and efficient and designed to meet a contractor's every hoist need, may be secured by writing to the Clyde Iron Works Sales Co. (R. I. Dunning, Asst. Sales Mgr.), Duluth, Minn.

DRILLS AND DRILL TOOLS
Drills and drill tools for every kind of big blast hole drilling are manufactured by the Sanderson-Cyclone Drill Co. (I. L. Albaugh, Sales Mgr.), Orrville, Ohio, who will be glad to send literature on request.

LEVER AND SCREW JACKS
The complete line of Simplex lever and screw jacks for use on engineering and construction projects is described in literature which may be secured from Templeton, Kenly & Co. (H. B. Burlow, Mgr. Jobbing Sales), Chicago, Ill.



THESE ARE SUPER-CONWEIGH
THREE-PULLEY TROUGHING IDLERS
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Designers and makers of complete mounting equipment for America's leading manufacturers of portable machinery. Wheels, trucks, trailers, crawlers, and parts built for individual requirements.

Catalogs on request

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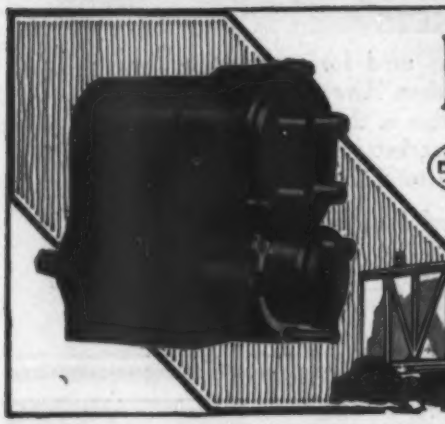

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Your Stone Handling Job with a

BURCH STONE SPREADER or UNLOADER

Get Our Catalog for Full Data

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CHIPPING CHISELS AND SPECIAL TOOLS

are shown in our new Catalog No. 9

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Greatest..Fastest mixing..Minimum capacity cost of operation

All these qualities of Iroquois Asphalt Mixing Plants are of the utmost importance to contractors and municipalities. They indicate the high perfection attained through more than forty years' experience in the construction of asphalt pavement, and upwards of a quarter-century's experience in the designing of equipment for that express purpose.

Iroquois Asphalt Mixing Plants are not only equal to every requirement, but their output actually far exceeds their guaranteed capacity. Among the latest improvements is a steam-jacketed pump for delivering asphalt from the melting kettles to the weigh bucket, with a rated capacity of 50 gallons of asphalt per minute. The asphalt end of the pump is completely steam-jacketed and has only three moving parts.

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black and white and 18 brilliant shades

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20 inches or 24 inches wide
Gasoline or electric power
Maximum capacity assured by wide troughed belt without use of side boards to cut belt edges.

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Contractors equipped with Carbic Flood Lights can depend on night work to keep up to schedule. Their night workmen can work as rapidly and as safely as their day force.

Carbic Flood Lights are low in first cost and inexpensive to operate. They fit in on any job. Simple—rugged—portable—always ready for instant service.

Work at Night with

CARBIC LIGHT

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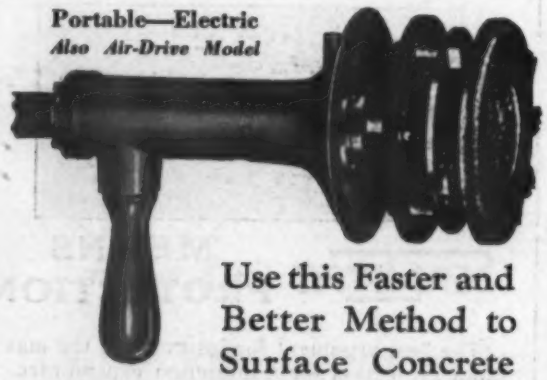
Also Air-Drive Model



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You can save time, money and labor with this New, Improved BERG. Unequalled for removing fins, board or form marks and all surface irregularities from concrete construction. Many other uses. Easy to operate. Light weight. Equipped with cutter and Carborundum Heads. Flexibly mounted to conform to any surface *One man with a BERG can do the work of four rubbing by hand.* Used and endorsed by leading architects, contractors and engineers. Write now for complete and interesting facts.

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Pioneer Makers of Machines for All Kinds of Concrete Surfacing
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"Standard of the World"

Steam, Gas and Electric Hoists, Dredge Hoists, Belt Hoists, Ship, Cargo and Dock Winches, Capstans, Cableways

Catalog Upon Request

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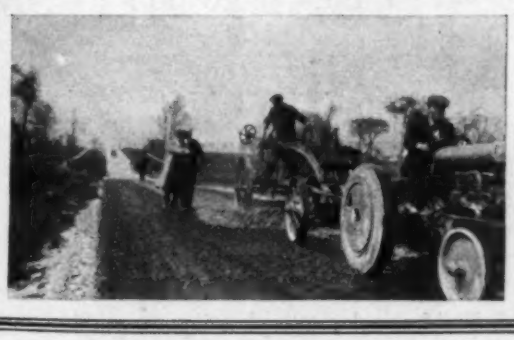
Application of cut back asphalt as a primer coat on existing stone base.

Application of cut back asphalt on stone which has been spread on the roadway.

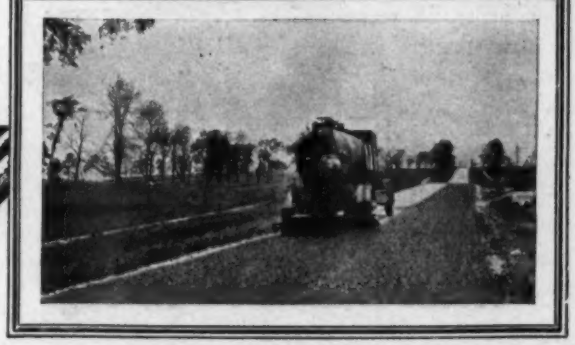
Many Towns Are Resurfacing Their Streets in This Manner—

BY the use of cut back asphalt. In Clarenden Hills, a suburb of Chicago, over seven miles of streets have been resurfaced with Stanolind Cut-Back Asphalt—resulting in smooth, attractive roadways which are easy to ride on.

The retread method was used, requiring only ordinary available equipment. This method of construction is economical and is suitable for nearly all types of roadways.



Mixing and surfacing of cut back asphalt and stone on the roadway with a blade grader.



Final application of cut back asphalt before completing roadway. Note the application of ¼ inch keystone on the surface.

STANDARD OIL COMPANY (*Indiana*)

General Offices: **910 South Michigan Ave. Chicago, Illinois**

ILLINOIS	INDIANA	IOWA	MICHIGAN	WISCONSIN	MINNESOTA	MISSOURI
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219

SELECT THIS TYPE FOR MINIMUM HEADROOM CLEARANCE

If you operate in a locality where low bridges are encountered, purchase a Rogers Girder Type Trailer.

To load, the rear wheels are removed, the shovel straddles the trailer, the frame is jacked up and the rear wheels are replaced. As illustrated, the load is raised only a few inches to clear the ground.

Loading is not as quick as with our standard deck-type trailers, but is unnecessary to unload, move forward and reload when low clearances are encountered.

These trailers also embody the Patented Rogers Oscillating Axle.

ROGERS BROTHERS CORP.

108 Orchard Street, Albion, Pa.

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GOOSE NECK — HEAVY DUTY

A Type for Every Purpose — Write for Catalog

EVERYWHERE

40 ft. 0 in. Portable Belt Type Conveyor equipped with shaker screen separating three sizes of materials and delivering one size into truck

CHICAGO AUTOMATICS

Are cutting, loading and unloading costs for thousands of contractors.

Write for Descriptive Bulletins

CHICAGO AUTOMATIC CONVEYOR CO.

Originators of the Portable Conveyor

1853 South 55th Ave. Cicero, Illinois

Manufacturers of

Portable and Stationary Belt and Bucket Type Conveyors and Loaders—Shaker Screens

Agents in all principal cities

C. H. & E.

has something new for you

Home Builder's Saw Rig

and

No. 18-A Saw Rig

With the new "TEXROPE" drive: all steel welded frame and steel table top.

Write now for additional information

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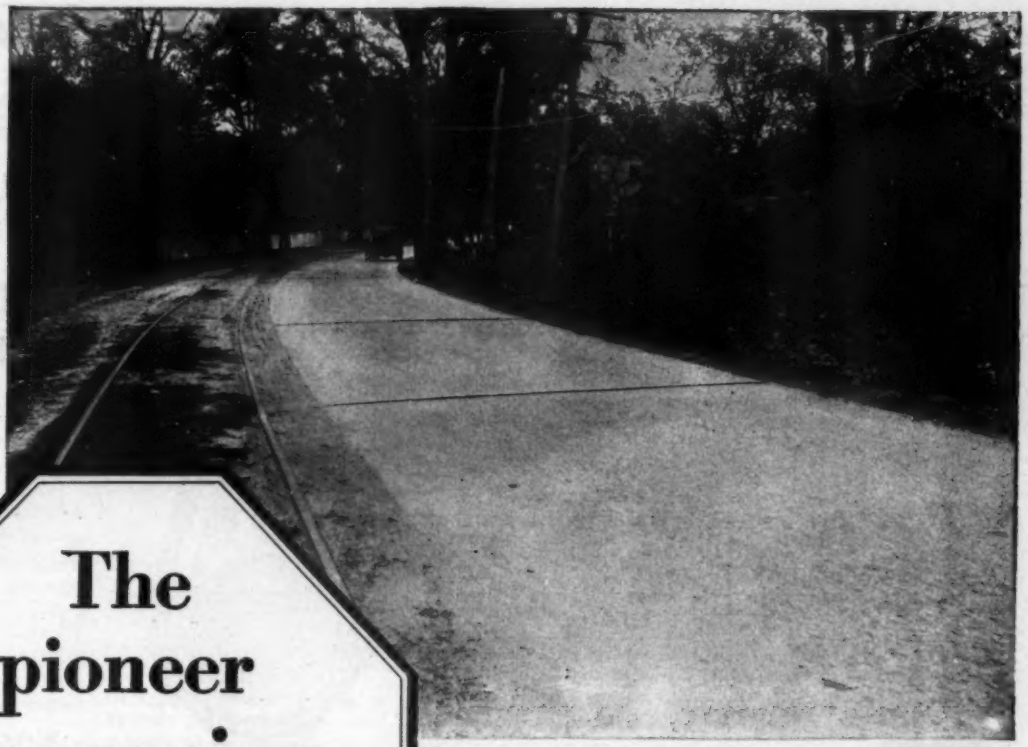
HAVE YOU CHECKED

Pages 3 to 30?

The Where to Purchase section in the front part of CONTRACTORS AND ENGINEERS MONTHLY is a very valuable aid to Contractors and Builders who are planning to purchase new equipment.

You may secure catalogs by writing direct to the manufacturers listed, or send a list to us and we will have them forwarded to you.



The famous Old Shell Road through Alabama, lastingly protected against expansion and contraction by Carey Elastite Expansion Joint, 160 joints to the mile.

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THE historic Old Shell Road, through Mobile County, Alabama, is one of the oldest highways in the South. One of the *smoothest* concrete roadways, too, in spite of the heavy, high-speed traffic that constantly pounds its surface.

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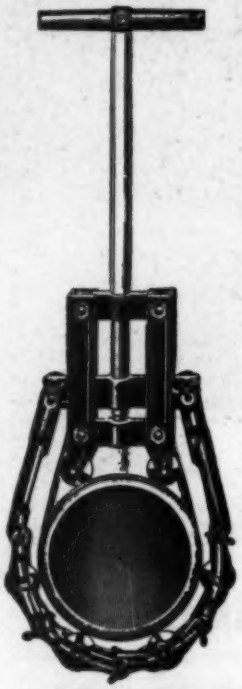

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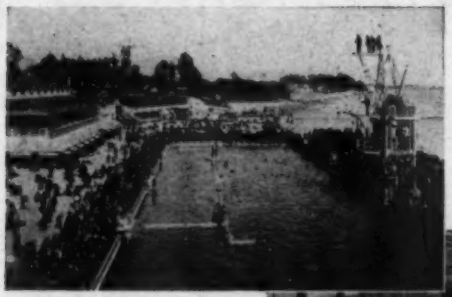

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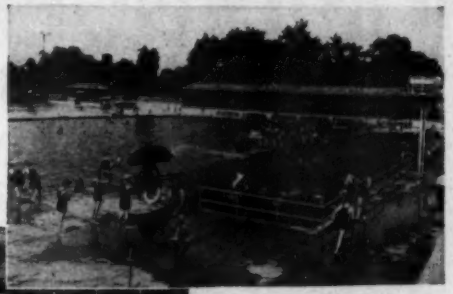

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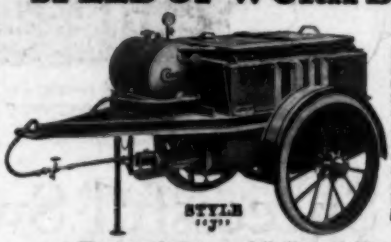

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